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quoting articles, please mention this BULLETIN.

CONTENTS

III. — Live Stock and Breeding.

a) General.

b) Special.

IV. — Farm Engineering.

V. — Rural Economics.

VI. — Agricultural Industries.

PLANT DISEASES.

II. — Diseases not due to Parasites or of Unknown Origin.

III. — Diseases due to Fungi, Bacteria and other Lower Plants.

A. General.

b) Special

V. — Injurious Insects and other Lower Animals.

a) General

b) Special

VI. — Injurious Vertebrates.

The Bureau assumes no responsibility with regard to the opinions and the results [illegible] outlined in the Bulletin.

The Editor's notes are marked (*Ed.*).

FIRST PART

THE INTERNATIONAL TRADE IN FEEDING STUFFS.

International Review, No. 2 — April 1, 1916

INTRODUCTION.

In accordance with a resolution of the last General Assembly of the International Institute of Agriculture (1), we now publish the second Review of the International Trade in Feeding Stuffs.

The preceding Review, published April 1, 1915, Vol. VI, N° 4 of this Bulletin, contained a list of the available statistical data, for various countries, relating to concentrated feeding stuffs for live-stock. The object of this, as explained in the Introduction, was to serve as a basis for the discussion of an international statistical survey of these products.

Following the plan approved by the Permanent Committee of the Institute at the meeting on December 13, 1915, this Review now appears in the form of systematic statistical tables, and constitutes a first attempt to fill a gap existing in our international agricultural statistics. These tables will contain statistical data relating to all such products for which official figures are forthcoming. Data concerning other products will be added as soon as their international movement acquires sufficient importance.

(1) INSTITUT INTERNATIONAL D'AGRICULTURE, IV^me^ Assemblée générale, décembre 1915, Rapport, p. 11.

The products treated in this Review may be divided into the following categories :

a) *Residues of Milling Industry ;*
b) *Oil* ;
c) *Sugar* ;
d) *Brewing and allied Industries.*
e) *Animal Origin.*

For information concerning cereals and other direct agricultural products, the reader is referred to the general statistics published in the *Annuaire international de Statistique agricole* and in the *Bulletin of Agricultural and Commercial Statistics*. At the same time, information is given wherever possible as to the relative quantity of these products utilised as concentrated foods for live stock. Further, a special table is devoted to the principal trade of those countries for which sufficient statistical data are in existence.

The five categories mentioned above are dealt with under the following headings :

Production. — The production of wheat and rye bran is taken first. This is calculated on the basis of the quantities of cereals available for consumption by means of a coefficient giving results closely approximating to the actual facts. Next comes the production of rice residues, husks and bran, this also being calculated on the basis of gross quantities available by means of a further coefficient.

Following the above will be found data relating to residues from the extraction of oil seeds and fruits. In this case an attempt has been made, for the first time, to establish the movement of the raw materials for exportation from the countries of origin and amounts available in the countries importing them ; in this way the necessary elements are obtained for calculating, again by means of a coefficient, the production of cake in a particular country.

Another method, however, has been adopted for linseed cakes in the case of which it has been possible to make a direct determination of the quantities available in the producing and exporting countries ; similarly for cotton seed cakes, in the case of which the chief producing country — the United States — has established special statistics ; and for rape cakes, where it has also been possible to calculate the production on the direct basis of the quantity of seed available.

The future development of this branch of our statistical work will enable us, it is hoped, to compile eventually statistics dealing with the production of cake for two other important centres : India and Egypt.

The availability data which serve as the basis of our calculations, when not already given among the elements of the present Review are taken from the *Annuaire international de Statistique agricole*, 1913 ; and 1914 or from the Monthly Bulletins of Agricultural and Commercial Statistics for the years 1915 and 1916, published by the Bureau of Statistics of the Institute.

Foreign Trade of the Various Countries. — Export and import figures

...given in a series of ten tables for all those products which actually ... are said to be capable of serving as concentrated foods for live-... We have classed together all those which, owing to similarity of ... or markets, are capable of homogeneous treatment.

...The first item under this heading is a table giving the amount of for... ...le in a number of cereal and pulse grains and roots, for which ...ities available for live-stock consumption are known.

... On account of the comparative disorganisation of the inter-... market, we have been obliged, for the present, to restrict ourselves ...ing the prices of the chief concentrates only in those markets which ...emained open for international trade.

...These prices will present a view of comparative price levels of such ...odities.

...In conclusion, it should be remarked that, wherever possible, the fig... ...elating to production and trade have been given for the last five ...ncluding 1915. The exceptions are formed by a certain number of ...ent countries and colonies, in the case of which the publication of ...ics has been delayed. The prices, on the other hand, are those of ...ear only and have been calculated on the basis of London exchange. ...e present state of affairs it has been impossible to give those for the ...ding years.

Bibliography. A list of 280 references will provide the reader with ...ation as to the progress made in the production and employment ...centrated and other similar foods for live-stock during the past ... they are taken from periodicals and other publications received by ...ternational Institute of Agriculture during the period March 31, ... March 31, 1916.

PRODUCTION OF CONCENTRATED FOODS FOR LIVESTOCK

(*Continued*)

As stated in the *Introduction*, the production of concentrated foods considered in the present Review has been calculated on the basis of the quantities of raw materials available for consumption by the animals and of extraction coefficients corresponding to conditions actually obtaining in the countries.

WHEAT (*Production* + *Imports* − *Exports*) × $\frac{25}{100}$

RYE (*Production* + *Imports* − *Exports*) × $\frac{35}{100}$

Production = quantity sown + Imports − Exports

BUCKWHEAT

Production in the form of

Husks (*Production* + *Imports* − *Exports*) × $\frac{20}{100}$

Bran (*Production* + *Imports* − *Exports*) × $\frac{10}{100}$

Production = quantity sown + Imports of flour in bulk − Exports of flour in bulk

Note. — In the case of Russia:

Husks (*Production* + *Imports* − *Exports*) × $\frac{20}{100}$

Bran (*Production* + *Imports* − *Exports*) × $\frac{10}{100}$

Imports = Imports of flour in bulk + Exports of flour in bulk

LINSEED CAKES (*Production* + *Imports* − *Exports*) × $\frac{50}{100}$

Production = quantity sown + Imports − Exports

COTTON CAKES. — Except in the case of the United States (for which the coefficient used is that given by official statistics) the production has been calculated by applying the extraction coefficient 0.50 to the quantities of cotton seed available for consumption. This variation is due to different conditions of extraction.

RAPE CAKES (*Production* + *Imports* − *Exports*) × $\frac{50}{100}$

Production = quantity sown + Imports − Exports

OTHER KINDS OF OIL CAKES. — The production has been calculated on the basis of the quantities available of the raw material.

RESIDUES OF BEET SUGAR INDUSTRY.

Beet-slices (calculated on quantity of dry matter) = Production × $\frac{5}{100}$

Molasses = Production × $\frac{3}{100}$

Residues of Milling Industry.

PRODUCTION OF WHEAT BRAN

Estimates of quantities of wheat available for consumption within the various countries

Countries	1913	1932	1933	1934	1935
	metric tons	metric tons	metric tons	metric tons	metric tons
[illegible]	14 50075	15 01 338	15 83 [illegible]	[illegible]	[illegible]
[illegible]	295 150	318 525	14 000	300 025	351 029
[illegible]	1 54 [illegible]	1 [illegible] 875	1 [illegible] 125	[illegible]	[illegible]
[illegible]	305 5 5	300 [illegible]	4 0025	[illegible]	[illegible]
[illegible]	103 125	181 300	21 [illegible]	143 [illegible]	[illegible]
[illegible]	100 [illegible]	110 [illegible]	128 328	[illegible]	[illegible]
[illegible]	54 075	68 [illegible]	[illegible]	53 [illegible]	[illegible]
[illegible]	231 000	184 [illegible]	237 [illegible]	208 300	230 321
[illegible]	612 300	623 000	[illegible]	[illegible]	[illegible]
[illegible]	1 322 125	4 [illegible]	1 [illegible]	4 241 [illegible]	4 [illegible]
[illegible]	2 [illegible]	2 200 825	2 318 225	2 [illegible]	1 [illegible]
[illegible]	181 007	113 [illegible]	186 [illegible]	[illegible]	1 [illegible]
[illegible]	28 [illegible]	13 [illegible]	[illegible]	14 [illegible]	[illegible]
[illegible]	1 [illegible]	1 [illegible]	1 [illegible]	1 [illegible]	1 [illegible]
[illegible]	215 [illegible]	210 [illegible]	2 [illegible]	201 [illegible]	[illegible]
[illegible]	[illegible]	577 [illegible]	582 [illegible]	[illegible]	1 [illegible]
[illegible]	1 [illegible]	1 [illegible]	1 [illegible]	1 [illegible]	2 [illegible]
[illegible]	15 [illegible]	1 [illegible]	32 [illegible]	33 [illegible]	[illegible]
[illegible]	1 [illegible]	1 [illegible]	1 [illegible]	1 [illegible]	1 [illegible]
[illegible]	175 117	182 [illegible]	206 [illegible]	192 [illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	130 [illegible]	1 [illegible]	130 [illegible]	128 118	186 [illegible]
[illegible]	71 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	200 875	140 [illegible]	51 [illegible]
[illegible]	1 [illegible]	5 [illegible]	5 [illegible]	5 [illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	131 600	138 [illegible]	151 225	131 [illegible]	[illegible]

In estimating the production of wheat bran in Germany, no has been made for ; per cent of the quantity of wheat available (... normally used as a concentrated food for live stock), as this ... is included within the limits of our calculation. (Cf. WAGE ... Entwicklung der Futtermittelhandels in den letzten Jahren. *... Dünger und Futtermarkt*, Jubiläumsausgabe, December ; and ... For Italy, we have taken into consideration (for 1915) the ... latters with regard to milling, imposing an 80 % flour with ... of offals.

With regard to the production of rye in Germany we have ... 10 % of the quantity available as this is the normal percent... ... used as a concentrated food for live-stock (*Ibid.*).

Production of rye bran

(calculated on basis of quantities of rye available for consumption.)

Country	1911	1912	1913	1914	
	metric tons	metric tons	metric tons	metric tons	
Germany	2 700 312	2 891 717	3 015 710	.....	
Austria-Hungary	1 112 685	1 262 272	1 136 000	.....	
Belgium	233 600	105 008	210 960	.....	
Bulgaria	35 781	38 146	47 724	.....	
Chili	224	1 056	1 088	800	
Denmark	180 320	170 712	197 012	120 074	
Spain	201 040	122 132	197 501	157 [illegible]	
United States	240 102	256 128	240 [illegible]	435 37[illegible]	
France	358 912	368 042	378 472	307 [illegible]	
Australia	992	110	704	.....	
Canada	19 520	18 770	16 992	13 204	
Italy	38 580	39 771	43 260	38 [illegible]	
Norway	43 357	61 820	68 189	54 280	
Netherlands	211 [illegible]4	198 [illegible]6	208 096	161 [illegible]2	
Roumania	.....	4 072	60 8[illegible]6	1 [illegible]20	
Russia in Europe and K in Asia	4 049 008	7 072 480	6 789 [illegible]00	5 335 [illegible]1[illegible]	
Sweden	183 135	198 074	167 008	.....	
Switzerland	19 776	18 052	18 [illegible]30	15 [illegible]	

Countries	1911		1912		1913		1914		1915	
	Husks	Bran	Husks	Bran	Husks	Bran	Husks	Bran	Husks	Bran
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
a) Producing countries.										
Spain	12 140	6 220	18 300	24 150	44 000	22 000	48 980	24 490	. . . . .	. . . . .
United States	87 080	43 000	106 980	50 140	103 280	51 630	66 400	48 200	120 140	60 060
British India	9 570 252	. . . .	6 008 538	. . . .	9 083 302	. . . . .	8 999 118	. . . . .	. . . . .	. . . . .
Italy	103 026	51 513	95 074	17 837	113 340	56 670	118 380	59 190	110 364	55 182
Japan	1 807 220	. . . . .	1 752 064	. . . . .	2 140 634	. . . . .	1 905 866	. . . . .	. . . . .	. . . . .
Dutch East Indies	1 008 620	. . . . .	1 064 491	. . . . .	1 025 346	. . . . .	1 285 414	. . . . .	. . . . .	. . . . .
b) Non-producing countries.										
Germany	30 041	15 300	29 074	10 037	32 678	16 339	. . . .	. . . . .	. . . . .	. . . . .
Argentine	3 400	1 700	2 900	1 480	3 520	1 760	2 320	1 160	. . . . .	. . . . .
Austria Hungary	22 380	11 190	16 200	8 100	17 018	8 509	. . . . .	. . . . .	. . . . .	. . . . .
Belgium	7 020	3 510	9 840	5 020	1 300	2 200	. . . . .	. . . . .	. . . . .	. . . . .
Denmark	0,8	0,4	0,2	0,1	1	0,6	0,6	0,3	. . . . .	. . . . .
France	15 080	7 540	11 656	5 828	9 456	4 728	7 860	3 930	12 100	6 050
Algeria	6	3	200	100	200	100	260	130	1 400	700
United Kingdom	10 020	5 000	19 360	9 680	17 720	8 860	. . . . .	. . . . .	. . . . .	. . . . .
Australia	4 080	2 040	5 280	2 640	5 060	2 530	. . . . .	. . . . .	. . . . .	. . . . .
Canada	3 040	1 820	3 580	1 790	4 420	2 210	4 620	2 310	5 280	2 640
Norway	100	50	20	10	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Russia	4 200	2 100	5 220	4 110	6 280	4 140	. . . . .	. . . . .	. . . . .	. . . . .
Sweden	2 000	1 360	2 980	1 462	2 040	1 020	2 160	1 080	4 380	2 190
Switzerland	2 780	1 360	1 860	600	2 760	1 380	1 920	960	. . . . .	. . . . .

Residues of Oil Industry.

Production of linseed cakes

calculated on quantities of seed as Table

Country	1911	1912	1913	1914
	metric tons	metric tons	metric tons	metric tons
a. Production in tons				
Austro-Hungary	23 804	27 504	30 670	
Belgium	42 200	41 725	50 765	
Bulgaria	104	77		
Chili	20	316	213	
United States	237 308	360 207	237 104	231 5 7
France	55 748	73 000	119 852	63 000
Algeria	27			
Canada	94 325	166 013		
British India				
Italy	23 783	24 410	27 170	18 041
Japan	347			
Netherlands	70 121	78 405	102 851	98 2 1
Roumania	4 215	6 548		17
Russia in Europe	77 115	94 202	145 500	
Sweden	10 135		11 115	
b. Imports in tons				
Germany	135 000	102 350	272 100	
Denmark	8 150	5 800	9 000	11 800
United Kingdom	131 500	134 000	308 000	231 500
Australia	750	1 150	1 718	2 280
Norway	4 000	5 000	7 150	5 000

Cottonseed.

Production of cottonseed cakes and meal in the United States (based on the crop yield).

Products	1901	1902	1903	1904	1905 (preliminary)
	metric tons	metric tons	metric tons	metric tons	metric tons
Cotton crop, lint	6 347 573	5 533 457	5 10 804	(6 804 881)	.....
Cottonseed:					
[illegible]	514 006	388 081	155 [illegible]46		140 306
[illegible]	220 210	240 730	283 130		99 851
Cotton seed crushed	281 030	288 111	351 [illegible]5		100 [illegible]8
[illegible]	306 284	226 543	3[illegible]2 044		73 044
[illegible]	1 200	21 435	300 [illegible]3		14 800
[illegible]	572 285	281 247	936 107		327 491
[illegible]	137 058	130 270	150 600		63 300
[illegible]	35 100	455 [illegible]03	4 [illegible]8 092		102 [illegible]27
[illegible]	20 338	25 [illegible]00	20 [illegible]35		8 554
[illegible]	308 040	373 [illegible]18	41 [illegible]02		145 312
[illegible]	130 140	235 [illegible]03	252 [illegible]34		82 125
[illegible]	1 425 157	1 058 [illegible]12	1 [illegible]73 939		555 [illegible]50
United States [illegible]	37 [illegible]23	55 [illegible]01	70 [illegible]078		10 053
	1 164 324	1 154 [illegible]01	1 32[illegible]270	5 243 220	(1 [illegible]97 200)
Production of cakes and meal	1 051 455	1 [illegible]81 [illegible]463	(1 806 017)	(2 206 542)	(1 [illegible]87 200)

Exports of cottonseed by producing countries.

Countries	1901	1902	1903	1904	1905
	metric tons	metric tons	metric tons	metric tons	metric tons
[illegible]	13 479	18 [illegible]968	11 [illegible]032	14 802	(1)
[illegible]	403 297	472 [illegible]302	[illegible]3 [illegible]703	41 [illegible]000	307 742
United States (year ending June 30)	5 098	20 [illegible]017	10 [illegible]908	7 [illegible]415	2 804
Possessions					
[illegible]	103 103	14 [illegible]1 230	218 [illegible]307	129 526	67 072
[illegible] (year ending March 31)	1 630	20 [illegible]1 [illegible]54	5 [illegible]704	(1)	(1)
	104 733	147 204	224 011	.....	.....
	677 417	667 161	619 654	(667 891)	(437 678)

(1) Not available.

Cottonseed trade of importing countries

Countries	1911	1912	1913	1914
	metric tons	metric tons	metric tons	metric tons
Germany:				
imports	155 785	214 097	219 797 (2)	120 [illegible]
exports	2 317	1 802	809 (2)	2 [illegible]
	153 418	212 295	218988	120 [illegible]
Austria-Hungary:				
import	5 802	11 233	3 813 (2)	2 [illegible]
export	..	1 498	1255	..
	5 802	9 735	2 558	2 [illegible]
France:				
imports	30 555	31 935	17 670	14 712
exports	267	141	925	708
	30 288	31 794	16 745	14 004
United Kingdom:				
imports	60 470	63 905	62 032	76 122
Japan:				
imports	11 894	..	12 039	14 375 (3)

(1) Figures not available. — (2) 1st half year. — (3) 11 months.

Production of cottonseed cakes in importing countries

calculated on quantities of seed available.

Countries	1911	1912	1913	1914
	metric tons	metric tons	metric tons	metric tons (1)
Germany	70 724	100 147	109 404	60 371
Austria-Hungary	2 001	4 807	1 279	1 018
France	15 144	17 397	8 372	7 017
United Kingdom	30 235	31 007	31 166	38 061
Japan	5 947	..	6 019	7 186

Production of rape cakes

(calculated on quantities of seed available).

Countries	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons
[illegible]	7 142	59 293	74 227	33 182	[illegible]
[illegible]ngary	147 378	10 001	22 000	4 216	[illegible]
[illegible]	22 661	17 045	18 595	11 825	[illegible]
[illegible]	1 585	44 006	24 211	13 153	[illegible]
[illegible]	00 455	1 562	1 072	19	4 043
[illegible]tain and Ireland	21 721	17 420	25 055	20 170	18 146
Italy	486 140	547 280	504 405	426 805	[illegible]
[illegible]	3 351	1 004	5 001	10 088	2 254
[illegible]	65 668	71 400	134 508	12 754	20 144
[illegible]	203	128	482	255	226
[illegible]ds	17 778	15 357	15 877	10 091	7 787
[illegible]	580	723	457	94	[illegible]

Ground-Nuts.

In the case of ground-nuts, figures are given both for whole pods and for hulled seeds. As, however, the yield in cake must be based upon the figures of the latter, we have converted the figures for the whole pods into their equivalents in hulled seed by allowing a normal yield of 75 per cent.

In addition to the data for ground-nuts, systematic statistics are given for the first time relating to other oil seeds and fruits in the chief producing countries. These products are daily growing in importance, not only in the economy of various colonies but also in their capacity as the basal material of such important concentrates in modern feeding practice as are copra and palm-kernel cake. It is intended, later on, to treat of other similar products which are not yet of sufficient general importance such as mowrah, perilla etc.

Exportation of ground-nuts by producing countries

Countries	1911	1912	1913	1914
	metric tons	metric tons	metric tons	metric tons
German colonies:				
Former German E. Africa	2 506	6 079	(1)	(1)
China:				
in hulls	*64 920*	*51 793*	*63 741*	*22 [illegible]*
equivalent in hulled seeds	18 640	38 815	47 800	17 [illegible]
hulled seeds			5 263	[illegible]
	48 690	38 815	(53 069)	(23 5[illegible]
Egypt *	877	794	557	[illegible]
French colonies:				
Senegal:				
in hulls	*164 968*	*184 762*	(1)	(1)
equivalent in hulled seeds	123 981	130 571		
Upper Senegal and Niger:				
in hulls	*5 111*	*1 761*	(1)	(1)
equivalent in hulled seeds	3 833	1 321		
hulled seeds		5 830	(1)	(1)
French Guinea:				
in hulls	*1 056*	*2 020*	(1)	(1)
equivalent in hulled seeds	792	1 515		
Mayotte and dependencies:				
in hulls	*34*	*34*	(1)	(1)
equivalent in hulled seeds	25	25		
Indo China:				
hulled seeds	202	405	(1)	(1)
French possessions in India:				
in hulls	*10*	*9*		
equivalent in hulled seeds	7	7		
hulled seeds	76	213		
	128 616	134 057		
British colonies:				
India	204 249	221 670	259 158	260 [illegible]
Gambia	48 700	65 109	68 486	
Nigeria:				
in hulls	*890*	*1 743*	(1)	(1)
equivalent in hulled seeds	667	1 307		
hulled seeds	1 198	2 559	(1)	(1)
	251 805	290 741	(327 644)	(260 [illegible]
Japan	1 679	3 019	5 928	5 [illegible]
Dutch colonies:				
East Indies:				
in hulls		*3 266*	*13 793*	*9 [illegible]*
equivalent in hulled seeds	(1)	2 449	10 345	7 [illegible]
hulled seeds	(1)	9 940	6 268	7 [illegible]
		12 389	16 613	15 [illegible]
Portuguese colonies:				
Portuguese S. E. Africa	(1)	5 113	(1)	(1)
	(440 173)	(491 940)	(403 811)	(310 [illegible]

* Exported for direct consumption. — (1) Figures not available. — (2) 11 months

Ground-nut trade of importing countries.

Countries	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons
[illegible]	44 534	(a) 8(a)	98 085	(2) 83 040	(1)
[illegible]	2 071	1 188	3 000 (2)	2 418	(1)
States (years ending					
[illegible]	7 844	5 865	5 571	7 025	6 590
[illegible]nt in hulled seeds	5 883	4 500	4 178	5 941	1 917
[illegible] seeds	[illegible]	1 102	3 085	12 282	4 571
	5 883	5 501	7 263	18 220	9 321
[illegible]					
[illegible]	216 770	222 380	255 713	270 194	255 713
[illegible]nt in hulled seeds	162 577	166 785	191 785	202 645	191 785
[illegible] seeds	178 379	245 256	247 754	200 811	247 754
	340 956	412 021	429 539	472 159	439 539
[illegible]					
[illegible]	15 237	13 644	16 999	12 631	8 015
[illegible]nt in hulled seeds	11 353	10 233	12 749	9 475	6 011
[illegible] seeds	4 358	5 965	2 192	1 000	3 015
	15 711	15 868	14 941	11 384	9 026
	325 245	390 123	414 598	461 975	430 513
[illegible]					
[illegible]	47 582	52 479	67 428	64 167	47 419
[illegible]	12 662	12 704	19 610	21 700	16 548
	34 820	39 385	17 812	42 467	40 868

[illegible] not available. — (2) 1st half-year.

Production of ground-nut cakes in importing countries.

(calculated on quantities available for consumption).

Countries	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons
[illegible]	22 267	34 934	49 042	41 970	[illegible]
[illegible]	1 037	594	1 833	1 200	[illegible]
States	2 941	2 795	3 631	9 113	4 660
[illegible]	162 022	198 661	207 299	230 537	209 956
[illegible]	17 410	19 692	23 906	21 233	20 434

Sesame.

EXPORTATION OF SESAME BY PRODUCING COUNTRIES

Countries	1911	1912	1913	1914
	metric tons	metric tons	metric tons	metric tons
German colonies:				
Former German E. Africa	1 514	1 881	(1)	(1)
China	125 324	120 892	123 091	75 038
Ottoman Empire *	18 402	12 192	(1)	(1)
French colonies:				
Upper Senegal and Niger	12	7	(1)	(1)
French Guinea	564	411	(1)	(1)
Indo China	1 030	894	(1)	(1)
	1 606	1 312	(1)	(1)
British possessions:				
India	136 313	62 360	104 069	100 049
Sudan	4 935	6 094	6 839	(1)
British E. Africa (year ending March 31)	2 060	3 191	1 088	3 871
Uganda (year ending March 31)	538	709	1 596	910
Nigeria	460	448	1 055	(1)
Sierra Leone	112	46	36	(1)
	144 427	73 151	117 683	105 721
Portuguese colonies:				
Portuguese E. Africa	(1)	1 330	(1)	(1)
	(1)	1 330	(1)	(1)
Dutch colonies:				
Dutch E. Indies	(1)	1 302	1 987	2 445
	(146 033)	77 005	(118 670)	(108 109)

* The figure for 1911 refers to the year ending March 13; that for 1914 to the exports from ports of Hinta, Gaffa, Mersina, Adalia, Ayas and Smyrna. — (1) Figures not available.

SESAME TRADE OF PRODUCING COUNTRIES.

Countries	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons
[illegible]	101 072	99 282	110 030 (2)	88 237	(1)
[illegible] Hungary:					
[illegible]	42 200	31 414	26 629 (2)	17 180	(1)
[illegible]	24	4	455 (2)	1	(1)
	42 176	31 410	26 174	17 188	—
[illegible]	6 397	2 544	4 018 (2)	4 306	(1)
[illegible]	98 373	10 041	20 586	21 635	15 874
[illegible]	2 669	1 314	925	708	1 055
	95 704	18 107	19 661	20 96[illegible]	13 019
[illegible]	40 870	25 358	24 771	28 803 (3)	32 615
[illegible]	19	27	16	20	12
	40 857	25 331	24 758	28 837	32 633
[illegible]	4 774	5 970	5 955	6 741 (4)	9 717
[illegible]	3 878	3 960	[illegible]	[illegible]	[illegible]

* Sesame and Ground-nuts. — (1) Figures not available. — (2) 1st half year. — (3) 10 months. — (4) 9 months.

PRODUCTION OF SESAME CAKE IN IMPORTING COUNTRIES.
(calculated on quantities available for consumption).

Countries	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons
[illegible]	50 836	47 641	58 019	44 118	[illegible]
[illegible] Hungary	21 088	15 705	13 087	8 594	[illegible]
[illegible]	3 198	1 272	2 909	2 198	[illegible]
[illegible]	47 852	9 098	9 830	10 483	6 959
[illegible]	20 428	12 665	12 379	14 418	16 316
[illegible]	2 387	2 985	2 977	3 372	4 858
[illegible]	1 939	1 999	[illegible]	[illegible]	[illegible]

Copra.

Exportation of Copra by producing countries

Countries	1911	1912	1913	1914
	metric tons	metric tons	metric tons	metric tons
German colonies:				
Former German E. Africa	5 421	4 212	(1)	(1)
Togoland	180	163	(1)	(1)
New Guinea and dependencies	14 523	17 301	(1)	(1)
Samoa	10 237	11 201	(1)	(1)
	30 370	32 007		
United States, Philippines	138 573	141 200	76 000	(1)
French colonies:				
Ivory Coast	22	22	(1)	(1)
Dahomey and dependencies	350	301	(1)	(1)
Gaboon		1	(1)	(1)
Indo China	7 550	7 982	(1)	(1)
New Caledonia and dependencies	2 561	2 856	(1)	(1)
French possessions in Oceania	8 684	6 113	(1)	(1)
	19 175	17 275		
British possessions:				
India (year ending March 31)	32 387	31 901	38 804	
Ceylon	41 750	51 107	59 555	
Federated Malay States	8 481	7 831	9 436	14 732
British Borneo	537	500	655	(1)
Sarawak	190	103	71	(1)
Seychelles	2 500	2 735	2 084	3 670
Mauritius	2	8	90	(1)
Tonga	12 025	11 208	3 481	(1)
Fiji	10 500	13 030	8 056	(1)
Brit. N. Guin. (year end. Mar. 31)	1 077	1 089	807	1 220
Solomon Isles (British)	205	182	213	203
Gilbert and Ellice Islands	2 103	(1)	(1)	(1)
Brit. E. Afr. (year ending Mar. 31)	1 871	1 611	1 589	1 612
Zanzibar	11 501	9 482	9 063	10 138
Gold Coast	792	630	949	(1)
Nigeria	98	96	98	(1)
Trinity	754	1 433	524	(1)
Jamaica	8	21	32	(1)
British Guiana	(1)	58	57	(1)
	(101 096	(114 580)	(132 801)	(70 472
Dutch colonies:				
Java	91 022	84 650	78 800	70 827
Macassar	38 064	37 822	29 570	
Sangir, Menado, Gorontalo	33 914	30 070	26 648	172 847
Padang	14 383	17 351	17 617	
	178 883	169 890	152 635	243 674
Portuguese colonies:				
Portuguese E. Africa	4 004	(1)	(1)	(1)
	1472 101	1475 861	1361 436	1570 1..

(1) Figures not available. — (2) 1st half year.

COPRA TRADE OF IMPORTING COUNTRIES.

Countries	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons
[illegible]	148 000	183 258	190 441 (2)	82 950	(1)
[illegible]	1 332	081	541 (2)	573	(1)
	149 734	182 277	190 000	82 383	.....
Germany:					
[illegible]	48 212	45 537	33 305 (2)	14 882	(1)
[illegible]	.....	.....	..... (2)		(1)
	48 212	45 537	33 305	14 882	.....
[illegible]	21 778	25 774	19 552 (2)	11 118	(1)
[illegible]	6 744	7 [illegible]0	6 [illegible]5 (2)	4 707	(1)
	15 034	18 004	12 595	6 411	.....
[illegible]					
[illegible]	25 005	21 595	31 144	13 000	(1)
[illegible] (year ending June 30)					
[illegible] for consumption	17 153	31 707	18 617	25 260	13 086
[illegible]	167 302	153 506	112 010	96 303	131 471
[illegible]	47	92	318	68	(1)
	167 345	153 414	112 328	96 295	130 018
Kingdom:					
[illegible]	(3)	(3	14 442	12 817	(3)
[illegible]	2 527	2 [illegible]08	2 558	3 038 (4)	3 070
[illegible]:					
[illegible]	91 730	102 230	100 635	109 420	210 288
[illegible]	78 014	78 350	82 356	77 108	106 845
	13 716	23 880	18 279	32 312	103 443
[illegible]	73 162	63 000	.....	.....	.....

[illegible] not available. — (2) 1st half year. — (3) Not specified. — (4) 11 months.

PRODUCTION OF COPRA CAKE IN IMPORTING COUNTRIES.

(calculated on quantities available for consumption within the various ...)

Countries	1911	1912	1913	1914
	metric tons	metric tons	metric tons	metric t...
Germany	73 367	91 138	97 950	41 [illegible]
Austria-Hungary	24 106	22 768	16 952	7 411
Belgium	7 517	9 302	6 297	3 [illegible]
Denmark	12 502	12 272	15 572	6 8[illegible]
United States	8 579	15 853	9 323	12 933
France	83 672	76 707	56 164	48 14[illegible]
United Kingdom			7 216	21 418
Japan	1 263	1 454	1 279	1 53[illegible]
Netherlands	6 858	11 940	9 139	16 136
Russia	36 581	31 953		

Oil-palm.

EXPORTATION OF PALM KERNELS BY PRODUCING COUNTRIES.

Countries	1911	1912	1913	1914
	metric tons	metric tons	metric tons	metric tons
German colonies:				
Cameroon	15 171	15 999	(1)	(1)
Togoland	13 287	11 639	(1)	(1)
	28 458	27 638		
French colonies:				
Senegal	1 327	1 764	(1)	(1)
Upper Senegal and Niger *	243	847	(1)	(1)
French Guinea	4 826	5 135	(1)	(1)
Ivory Coast	5 251	9 709	(1)	(1)
Dahomey and dep.	39 346	37 296	(1)	(1)
Gaboon	405	350	(1)	(1)
Indo China	8	42	(1)	(1)
	51 196	52 242		
British possessions:				
Nigeria	179 220	187 587	177 524	165 05[illegible]
Sierra Leone	43 580	515 740	49 991	(1)
Gold Coast	13 467	14 864	9 899	(1)
Gambia	450	452	551	(1)
	230 717	718 643	237 968	(165 05[illegible]
	316 671	798 523	237 968	(165 05[illegible]

(*) Kernels of *Hydnocarpus*. — (1) Figures not available.

TRADE IN PALM KERNELS OF IMPORTING COUNTRIES.

Countries	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons
[illegible]					
[illegible]	250 664	201 408	235 917 (2)	113 205	(1)
[illegible]	(1)	(1)	(1)	(1)	
Austria-Hungary:					
[illegible]	30 040	30 900	27 043 (2)	1 127	(1)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]					
[illegible]	4 205	5 402	4 205 (2)	2 202	(1)
[illegible]	700	505	700 (2)	608	(1)
	3 475	5 837	3 475	1 504	[illegible]
[illegible]					
[illegible]	1 495	1 773	595 (2)	496	(1)
[illegible]					
[illegible]	1 088	2 077	2 986	3 135	18 493
[illegible]	10	40	12	7	4
	1 078	2 037	2 974	3 128	18 489
United Kingdom:					
[illegible] for consumption	(1)	(1)	(1)	66 665	(1)
[illegible]	204	254	110	343	(1) 519
Netherlands:					
[illegible]	12 845	50 803	63 771	50 187	25 829
[illegible]	43 110	48 139	57 593	35 531	83
	— 271	8 124	6 118	20 053	25 740

* Including *Celebes, Stillingia* and *Illipe*. — (1) Figures not available. — (2) 1st half year. — (3) Not specified months.

PRODUCTION OF PALM KERNEL CAKES IN IMPORTING COUNTRIES
(calculated on quantities available for consumption)

Countries	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons
[illegible]	125 332	130 701	117 058	56 662	[illegible]
Austria-Hungary	15 020	19 053	13 521	503	[illegible]
[illegible]	1 737	2 918	1 737	782	[illegible]
[illegible]mark	747	886	207	203	[illegible]
[illegible]	980	1 018	1 487	1 564	9 229
United Kingdom	[illegible]	[illegible]	[illegible]	33 332	[illegible]
[illegible]	102	127	55	171	259
Netherlands	[illegible]	4 212	3 074	19 326	12 873

Residues of Sugar Industry.

Production of beet residues.

Country	1901	1902	1903	1904
	metric tons	metric tons	metric tons	metric tons
a) Dried slices				
Germany	153 030	832 110	847 000	815 94
Austria	212 400	396 140	348 100	338 70
Hungary	149 380	241 085	243 250	260 71
Belgium	75 335	80 515	60 595	
Bulgaria	1 260	3 065	1 250	15
Denmark	30 525	40 300	46 500	48 36
Spain	39 590	39 590	50 100	
United States	220 625	230 075	256 000	253 58
France	211 700	361 105	301 505	18 555
Australia	410	205	320	380
Canada	7 940	9 115	6 715	4 02
Italy	79 220	87 150	136 500	67 50
Netherlands	100 250	108 805	85 265	90 71
Roumania	13 155	14 610	14 120	11 250
Russia in Europe	677 220	536 200	617 585	
Asia	170			
Serbia	1 585	7 500		
Sweden	48 475	42 325	42 200	43 805
Switzerland	1 155		1 580	1 350
b) Molasses.				
Germany	181 212	332 841	338 800	348 370
Austria	84 990	158 470	130 240	135 30
Hungary	59 752	96 704	97 300	80 280
Belgium	30 134	31 606	27 838	
Bulgaria	1 304	1 226	1 700	1 600
Denmark	14 010	10 720	18 600	19 350
Spain	15 830	15 836	23 040	
United States	91 850	91 700	102 076	101 332
France	81 716	144 442	120 602	75 022
Australia	124	82	128	152
Canada	3 170	3 640	2 686	1 67
Italy	31 688	34 800	54 000	27 00
Netherlands	40 100	43 522	33 306	39 883
Roumania	5 262	5 841	5 648	4 50
Russia in Europe	270 888	214 480	247 034	
Asia	188			
Serbia	1 834	3 000		
Sweden	16 310	16 030	16 004	17 51
Switzerland	102		632	54

FOREIGN TRADE OF VARIOUS COUNTRIES

Country	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany:											
Barley	3 177 930	4 750 025	3 685 097	871 660 495	(2)	1 854	1 167	6 018 (1)	2 216	(2)	
Beans	24 800	25 565	15 500 (1)	7 049	(2)	269	159	872 (1)	395	(2)	
Lentils	17 015	11 286	6 069 (1)	8 557	(2)	836	457	727 (1)	637	(2)	
Vetches	21 627	25 181	15 205 (1)	12 000	(2)	1 227	1 295	944 (1)	471	(2)	
Austria-Hungary:											
Vetches	5 758	6 167	505 (1)	2 702	(2)	1 142	5 748	4 500 (1)	1 956	(2)	
Belgium:											
Seeds and their products, other than	24 627	14 011	13 311 (1)	511	(2)	3 142	5 748	2 500 (1)	606	(2)	
French colonies:											
Dutch Colonies:											
Dried manioc						2 265	1 158	5 445	(2)	1	
Netherlands:											
Wheat	15 914	17 005	21 026	(2)	(2)	12 565	14 004	17 368	(2)	(2)	
Rye	7 160	5 575	6 551	(2)	(2)	1 073	2 302	1 805	(2)	(2)	
Barley	11 240	8 308	11 157	(2)	(2)	8 446	6 526	2 567	(2)	(2)	
Buckwheat	224	250	200	(2)	(2)	77	50	6 765	(2)	(2)	
Beans and vetches	142	581	2	(2)	(2)	301	262	(2)	(2)	(2)	
Dutch colonies:											
Dutch E. Indies:											
Dried roots											
and residues of manioc						(2)	12 900	14 158	6 541	(2)	
							17 411	25 949	17 617	(2)	

(1) Net balance. — (2) Figures not available.

Residues of Milling Industry.

FOREIGN TRADE IN BRAN (wheat, etc.).

Countries	Imports					Exports				
	1911	1912	1913	1914	1915	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	1 429 717	1 606 250	1 414 250 (1)	1 010 703	(2)	19 122	10 708	23 284 (1)	13 150	(2)
Argentine	...	...	...	...	...	211 034	325 220	274 058	230 934	145 449
Austria-Hungary	139 281	147 882	110 024 (1)	66 331	(2)	60 415	57 185	30 501 (1)	23 080	(2)
Belgium	72 015	55 776	73 174 (1)	45 843	(2)	31 220	42 008	22 048 (1)	16 501	...
China	89 198	59 368	127 561	100 515	...	34 535	45 137	62 109	25 803	...
Denmark	43 570	55 277	45 221 (1)	21 305	(2)	...	...	...	...	...
Spain	15	1 555	5 209	68	8	2 783	3 094	215	400	1 301
United States	...	...	...	...	...	109 715	85 290	4 070	5 281	...
France	157 139	171 688	231 931	201 852	16 145	33 245	36 888	35 549	11 478	9 854
Algeria	...	...	...	...	...	19 363	14 051	19 935	14 116	9 128
Tunis	...	...	...	...	...	1 788	2 586	...	...	...
United Kingdom	201 801	209 674	232 066	248 472	111 030	103 710	317 121	102 018	84 118	2 679
Australia	3	2 018	424	...	...	9 767	6 706	12 222	...	...
Canada (year end. Mar. 31)	...	...	...	...	...	95 106	81 077	84 450	105 552	52 739
British India	3 458	2 764	3 850	2 582	2 673	203 014	214 201	214 250	193 320	106 351
Italy	15 495	9 187	10 018	4 287 (3)	3 449	17 626	28 155	31 823	37 275 (3)	5 337
Japan	...	28 184	39 558	14 989	18 450	...	...	...	...	...
Norway	...	...	...	...	...	36 251	21 256	15 975	10 992	40
Netherlands	90 695	40 646	13 826	(2)	(2)	56 303	66 575	63 937	(2)	(2)
Dutch Indies	...	7 177	7 172	9 045	...	...	585	324	491	...
Russia	...	...	...	...	...	803 394	835 202	791 000	448 500 (4)	271 000
Sweden { Wheat	58 413	58 385	55 580	46 386	(2) 201 420	3 280	2 020	1 [illegible]	2 [illegible]	...
{ other than wheat	3 924	2 945	2 471	1 584		4 172	23 [illegible]	24 [illegible]	8 [illegible]	
Switzerland	11 [illegible]	11 [illegible]	[illegible]	5 [illegible]		[illegible]	11 [illegible]	[illegible]	11 [illegible]	

Countries	Import					Export				
	1911	1912	1913	1914	1915	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	160 960	213 741	206 475 (1)	87 450	(.)	4 410	7 285	4 068 (1)	3 635	(.)
Argentine						2 519	2 159	2 574	1 301	
Austria-Hungary	9 610	13 870	5 816 (1)	2 002	(2)	20 247	15 747	11 079 (1)	2 544	(2)
Denmark	2 340	3 380	4 495	(2)	(2)					
France	42 557	26 718	50 419	76 980	71 740	3 687	2 260	9 645	28 864	16 779
Indo-China						110 759	107 997	238 270	(2)	(2)
United States	54 070	55 368	65 345	17 620	35 834	4 733	7 070	1 975	2 014	602
Australia	3	22	13	(2)	(.)	2 570	3 233	2 160	(.)	(2)
Japan		13 284	16 121	8 676	1 755					
Norway	2 883	2 767	1 560	2 520	446					
Sweden	260	5 069	4 007	1 209		71	268	315	310	

(1) 1st half year. — (2) Figures not available. — 3 10 months

Foreign trade in various milling residues (other than bran).

Countries	Imports					Exports				
	1911	1912	1913	1914	1915	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Argentine:										
Maize residues						1 280	1 742	1 060	1 200	
Austria-Hungary:										
Mill feed		12		2		471	780	1 148 (1)	1 005	(2)
United States:										
Mill feed						53 002	139 562	15 022		19 703
Italy:										
Wheat (hard) pollards (re-sifted)						22 205	22 027	27 336	25 192 (3)	1 423
Netherlands:										
Pollards	38 193	10 500	20 616	8 755	(2)	9 707	12 950	13 068	(2)	(2)
Mill feed (wheat, rye, buckwheat)	284 024	281 021	311 060	(2)	(2)	84 023	95 532	100 810	(2)	(2)
Switzerland:										
Mill feed					(2)					
Malting feed					(2)					

FOREIGN TRADE IN LINSEED CAKES AND MEAL

Countries	Imports					Exports				
	1911	1912	1913	1914	1915	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Austria Hungary	1 791	3 882	4 989	(1) 1 829	(-)	15 051	15 304	18 245	(1) 11 066	(2)
Denmark	11 618	11 331	60 015	(1) 60 210	(-)	59	272	147	(2)	(2)
Spain						1 161	1 412	750	418	519
United States						238 615	310 791	391 502	230 066	
United Kingdom	52 819	55 135	88 679	17 565	66 047	2 554	4 977	5 551	3 796	96
Netherlands	198 337	201 000	275 122	229 849	*210 024					
Russia						147 239				
Sweden		2 102	4 359	1 021			313	224		

(1) 1st half-year. — (2) Figures not available.

FOREIGN TRADE IN COTTONSEED CAKES AND MEAL

Countries	Imports					Exports				
	1911	1912	1913	1914	1915	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Denmark	172 842	242 850	232 555	(1) 103 458	(2)					
United States						497 872	543 479	435 893	285 455	661 534
United Kingdom			214 348	166 168	188 265			7 042	4 017	2 733
Netherlands	20 330	35 059	25 270	19 251	2 182					
Sweden	4 211	17 864	15 485	13 080		21	172	1 704	1	

(1) 1st half-year. — (2) Figures not available.

Foreign trade in various feeding cakes (unnamed, etc.)

Countries	Imports					Exports				
	1911	1912	1913	1914	1915	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	756 772	794 100	828 492 (1)	567 317	(2)	235 235	203 023	204 174 (1)	171 310	(2)
Argentine	.....	.....	.....	.....	.....	20 228	17 022	20 052	17 405	18 479
Austria Hungary	56 352	42 602	32 210 (1)	12 157	(2)	20 007	20 725	31 235 (1)	16 884	(2)
Belgium	240 223	242 354	255 952 (1)	116 511	(2)	70 042	71 423	56 810 (1)	20 731	(2)
China	56	101	19	14	.....	695 303	544 513	793 830	723 519	.....
Denmark	313 340	260 019	287 305 (1)	151 085	(2)	16 169	10 145	15 135	(2)	(2)
Egypt	.....	.....	.....	.....	.....	85 173	80 778	62 977	79 987	111 670
France	142 795	154 068	101 573	72 711	3 785	222 794	213 090	214 801	179 017	111 079
Algeria	4 711	3 091	2 684	2 112	1 768	.....	.....	.....	.....	.....
United Kingdom	77 681	45 381	78 288	80 540	118 708	(a) 60	60 293	35 867	29 894	20 232
Australia	603	458	146	(2)	(2)	57	40	32	(2)	(2)
Ceylon	.....	.....	.....	.....	.....	3 055	2 575	3 704	.....	.....
British India	.....	18	52	500	402	135 001	150 650	181 676	151 342	152 285
Nigeria	.....	.....	.....	.....	.....	.....	.....	4 810	1 254	(2)
Union of South Africa	.....	.....	.....	.....	.....	126	2 136	2 810	963	.....
Italy	5 385	3 913	2 957	1 121 (3)	1 203	40 735	20 194	19 062	54 693 (3)	3 724
Japan	1 058 760	910 480	744 093	2 167 626	830 831	.....	.....	.....	.....	.....
Norway	28 782	29 665	30 122	37 668 (3)	29 180	457	342	3 770	952 (3)	607
Netherlands	67 150	76 451	47 283	21 510	20 034	.....	.....	.....	.....	.....
Dutch E. Indies	(2)	221	693	707	(2)	(2)	4 028	4 952	1 427	(2)
Russia	.....	.....	.....	.....	.....	509 568	556 161	731 200	421 400 (4)	71 100
Sweden	154 030	151 853	145 416	108 805 (1)	82 171	242	.....	133	28	.....
Switzerland	41 121	41 091	29 028	17 608	.....	866	1 150	1 115	963	.....

Countries	Imports					Export				
	1911	1912	1913	1914	1915	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany: beet-slices	9 271	51 500	25 819	(1) 5 878	(2)	42 793	4 382	7 672	(1) 1 704	(2)
Austria-Hungary: beet-slices	14 147	13 367	11 277	(1) 6 015	(2)	14 405	17 462	18 086	(1) 413	(2)
Denmark: molasses	7	13	9	(2)	(2)	4 865	84	197	(2)	(2)
molasses feed	1 478	2 552	938	(2)	(2)	4 407	4 622	4 261	.....	.....
United States: beet-pulp (year ending June 30)	1 215	.....	.....	.....	.....	.....	.....	.....	.....	.....
France: dried beet pulp	48 113	42 938	1	6	13	1 138	902	488	648	154
British Guiana: molascuit*	.....	.....	.....	.....	.....	5 184	5 198	6 970	(2)	(2)
Mauritius: molascuit	.....	.....	.....	.....	.....	12	376	434	(2)	(2)
Norway: molasses	.....	5 058	6 704	7 087	(3) 9 143	.....	.....	.....	.....	.....
Dutch E. Indies: molascuit*	.....	.....	.....	.....	.....	(2)	3 536	18 208	12 355	(2)
Sweden: molasses feed	6 247	6 712	4 986	3 345	.....	1 069	1 136	.....	541	.....

(1) 1st half-year. — (2) Figures not available. — (3) 10 months.

Residues of Brewing and Allied Industries.

Brewers' offals (Coombs, etc.).

Countries	Imports					Exports				
	1911	1912	1913	1914	1915	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	154 060	130 528	157 256 (1)	69 090	(2)					
Argentine						1 856	804	207	1 462	
Austria Hungary	1 730	2 538	2 194 (1)	1 285	(2)	2 552	1 253	1 210 (1)	408	(2)
Denmark	455	742	978	(2)	(2)	230	106	84	(2)	(2)
United States						78 000	72 000	81 925	20 607	2 256
United Kingdom	3 904	4 091	1 345	(2)	(2)	8 130	5 232	5 704	(2)	(2)
Australia	1	2	2	(2)	(2)	1 864	2 337	1 542	(2)	(2)
Switzerland	3 189	5 513	6 153	3 878	(2)	4 224	3 954	4 194	4 221	(2)

(1) 1st half-year. — (2) Figures not available.

Distillery and starch residues, etc. (Dried grains, etc.).

Countries	Imports					Exports				
	1911	1912	1913	1914	1915	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	93 603	67 747	68 000 (1)	20 297	(2)		3 044	5 178 (1)	4 031	(2)
Austria Hungary	1 065	3 121	1 397 (1)	2 000	(2)	907	525	230 (1)	170	(2)
Denmark (gluten)	751	906	21	(2)	(2)					
United States maize germ cakes and meal										
France										
Sweden maize and malt										

Residues of Animal Origin.

	Imports					Exports				
	1911	1912	1913	1914	1915	1911	1912	1913	1914	1915
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2 202	3 374	2 711	1 701	101
[illegible]	[illegible]	50	50	304	(1)	(1)	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12 31[illegible]	4 548	8 029	8 078 [illegible] 9 033

[illegible] not available. — (1) 10 months.

WHOLESALE PRICES OF CERTAIN FEEDING STUFFS.

[illegible]ing to the present condition of the international money market, [illegible]ference between the value in francs at par and that actually quoted [illegible]various markets is very marked. Consequently, in order to have [illegible]ble data we have converted the prices in francs at par to terms of [illegible]ces. Considering the pound sterling as practically equivalent to [illegible] has been made of the exchange on London. A list of quotations [illegible] below; the conversion coefficients can then be calculated by divid[illegible] rate at par by that obtaining on the particular date under con[illegible]ion.

Exchange on London at the end of each month

(Value of the pound sterling relative to various currencies).

Dates	United States	France	Italy
	Dollars.	Francs.	Lires.
[illegible] (parity upon)	(4.86665)	(25.221 f)	(25.221 f)
[illegible] July 1915	4.85 1/2	25.11 1/4	26.00
May	4.81	25.27 1/2	28.10
[illegible]ch	4.80	25.45	27.55
April	4.79 1/2	25.50	27.85
[illegible]ch	4.78 3/4	25.02 1/2	27.02 1/2
[illegible]	4.77 1/4	26.16	28.45
[illegible]ber	4.76 7/8	26.50	30.27 1/2
[illegible]ber	4.63 3/4	27.73 1/2	30.05
September	4.70 3/4	27.00	29.00
[illegible]ber	4.65 1/2	27.53	29.95
November	4.70	27.78	30.25
December	4.73 1/2	27.66	31.16

Residues of Milling Industry.

SPOT PRICES FOR WHEAT BRAN (per 100 kilos).

Date		Genoa	London	Minneapolis	
		gold francs	gold francs	gold francs	
End January	1913	18.28	16.13 17.06	13.17–13.45	
» February	»	16.16	17.06–17.68	11.50–12.14	
» March	»	18.31 18.52	16.44 16.75	12.17–12.35	
» April	»	19.02	17.06–17.68	11.60–12.76	
» May	»	18.26	14.89	11.03–11.62	
» June	»	13.30	15.20 15.51	11.66–11.91	
» July	»	13.75	15.20 15.82	12.25 12.53	
» August	»	14.27	16.75 17.06	11.09–11.30	
» September	»	14.09	16.44 16.75	10.48 10.63	
» October	»	13.80	17.99 18.61	10.60–10.75	
» November	»	16.27	20.47 21.22	10.04–10.95	
» December	»	17.09	21.71 21.96	10.50 11.15	

Residues of Oil and other Industries.

SPOT PRICES FOR LINSEED CAKES (per 100 kilos).

Date		Genoa	London	Marseilles	
		gold francs	gold francs	gold francs	
End January	1913		26.90 27.30		
» February	»		27.61 28.23		
» March	»		25.44 26.09		
» April	»		23.58 24.20		
May	»		24.82–25.44		
» June			25.44		
» July	»		27.92–28.54		
August	»		28.54 29.19	25.46	
» September	»		28.54 28.85	26.27	
» October	»		27.92–29.78	27.48	
» November	»		30.00–30.71	29.05	
» December	»		31.02–31.61	29.05	

SPOT PRICES FOR COTTONSEED CAKES (per 100 kilos).

Date	London	New York (*c.i.f.* New Orleans)
	gold francs	gold francs
January 1913	10.13	12.00
July	16.41–16.75	14.74
1918	15.82	14.77
"	15.35–15.51	.....
"	16.13–16.44	.....
"	16.13	13.98
"	17.80	.....
1919	19.85	.....
September "	20.78	14.70–15.04
October	22.33	16.73–17.02
November "	23.20–23.58	17.10
December	24.51–24.82	17.03

SPOT PRICES FOR GROUND-NUT CAKES (per 100 kilos).

Date	Genoa	London	Marseilles
	gold francs	gold francs	gold francs
January 1913	.....	22.02	.....
February "	.....	.....	.....
March "	.....	.....	.....
April "	.....	.....	.....
May "	.....	.....	.....
June "	.....	21.71	.....
July "	.....	21.71	12.85
August "	.....	21.71–22.02	13.19
September	17.04–17.89	21.71	16.22
October	16.84–17.68	23.58	14.66
November "	16.51–17.34	23.89	14.75
December	16.19–17.00	26.79	15.73

Spot prices for copra cakes (per 100 kilos).

Date		Genoa	London
		gold francs	gold francs
End January	1913	20,63–21,10	18,92
„ February	„	19,52–19,97	18,92–19,23
„ March	„	19,91–20,37	17,87
„ April	„	19,10–20,15	19,75
„ May	„	19,86–20,77	16,75–17,37
„ June	„	19,28–19,72	17,90
„ July	„	16,25–17,08	19,23
„ August	„	16,37–17,21	19,85
„ September	„	16,62–17,47	20,47
„ October	„	16,42–17,26	21,10
„ November	„	16,51–16,92	22,34
„ December	„	16,50–17,00	24,59

Spot prices for sesame cakes (per 100 kilos).

Date		Genoa	Mar
		gold francs	
End January	1913	21,50–22,03	
„ February	„	20,94–21,09	
„ March	„	21,06–21,51	
„ April	„	20,83–21,28	
„ May	„	21,00–21,40	
„ June	„	20,30–20,83	
„ July	„	16,66–17,50	13
„ August	„	16,70–17,25	13
„ September	„	17,01–17,47	14
„ October	„	16,84–17,26	13
„ November	„	15,08–16,51	12
„ December	„	15,38–16,19	12

SPOT PRICES FOR VARIOUS CAKES (per 100 kilos).

Date	Palm kernel — London	Maize — New York
	gold francs	gold francs
1913	17.06	16.04 16.61
"	17.37	20.24 20.81
"	16.44	17.38-17.96
"	15.51	12.70 13.01
"	14.89	12.78 13.94
"	[illegible]	12.82 13.08
"	[illegible]	12.83-13.09
"	[illegible]	17.08
[illegible]	[illegible]	16.83
"	17.37	17.02
"	19.23	16.86
"	[illegible]	16.73

Common Standards of Measurement for Chief Concentrates and their Metrical Equivalents.

Markets	Standard	Metrical equivalent
		kg.
Bran.		
[illegible]	100 kg.	[illegible]
Hungary	Zentner	50
States	Long ton	1 016
	Short ton	907.18
	100 kg.	[illegible]
Kingdom	Ton	1 016
	Short ton	907.18
	Bazaar maund	37 251
S. Africa	Bag	66.40
	Quintale	100
	Pond	16.38
Oil Cakes.		
[illegible]	Doppelzentner	100
	Picoul	60.479
	Ardeb	121 23
States	Long ton	1 016
	Short ton	907.185
	100 kg.	[illegible]
Kingdom	Ton	1 016
	Ton	1 016
	Bazaar maund	37.324
	10 Kwan	37.50
[illegible]	100 kg.	[illegible]
	Pond	16.38

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SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

Oil of Citronella as a Preventive of Mosquito Bites. — GRAND-HOC, in *The Journal of Tropical Medicine*, Vol. XXIV, No. 2, pp. 27-28. — Hugs, London, February 1921. RURAL HYGIENE

An account of the good results obtained by the use of oil of citronella (*Andropogon Nardus*) in protecting from mosquito bites the crew of a ship moored at Hankow. About half a drachm or less in the palm of the hand is sufficient to anoint the feet, ankles, hands and face, and to render immune for at least four hours, and often for the whole night. Citronella is very cheap if bought wholesale, although sold at 6d. an ounce retail. 10 lbs. lasted practically the whole summer and was used by nearly every one on board.

The First 50 Years of the Moscow Higher School of Agriculture. — I. KAYSAM, Vice-President of the Academy of Petrowskoie-Rasoumowskoie: The Agronomic Institute of Moscow, fifty years of activity (1865-1915) (in Russian), *Sbornik Khozyaistva i Lesovodstva*, Year LXXV, No. 5/6, CCXLIX, pp. 331-367; Petrograd, Nov. 1915. — P. MOROSOW, G.: Tribune to the Academy of Petrowskoie, in *Lesnoi Journal*, Year XLV, No. 5/6, pp. 1-4; Petrograd, 1915. — III. BROUNST, W.: The Academy of Petrowskoie-Rasoumowskoie: The Agronomic Institute of Moscow, in *Zemledelcheskaja Gazeta*, No. 44, pp. 12-15; Petrograd, November 21, 1915. — IV. FRANCHINIKOW, D.: Degrees in Science, *Ibid.*, pp. 1372-1376. — V. JURKEVICH, J. W.: The Chair of Agronomy at the Academy of Petrowskoie-Rasoumowskoie, in *Sel'skoe Khozyaistvo i Lesovodstvo*, Year LXXV, Vol. CCXLIX, pp. 368-372; Petrograd, 1915. AGRICULTURAL EDUCATION

The Higher School of Agriculture at Moscow is one of the oldest in Russia, the first of these institutions being founded in 1841 at Gori Gorkakh in the Government of Moghileff.

Its importance and the influence which it has continuously exercised in the country justify its claim to be a "National Institution" comparable with the National Agronomic Institute of Paris, the National School of

Agriculture at Grignon and the Higher School of Agriculture at [illegible] scientific organization and the continued adaptation of its [illegible] modern necessities are exemplified by the modifications int[illegible] recent years in curricula and methods, which not only relate to [illegible] cultural training in Russia, but also bear upon the most impo[illegible] cational problems now pressing for solution in almost every co[illegible]

The creation of the Higher School is due to the great refo[illegible] second half of the last century. It took place in 1865 at the [illegible] abolition of serfdom in Russia. The institution began its existe[illegible] epoch of the great awakening of social energies, when agricultu[illegible] conditions of rural Russia attracted the attention and activity bo[illegible] people and the Government. The new School thus became by [illegible] of circumstances at this epoch the intellectual centre of rural R[illegible] foundation owed its initiative to the Agricultural Association o[illegible] and it met with such favour in ruling circles that in 1861 a d[illegible] signed installing the school on the historic estate of Petrows[illegible] mowskoie, situated within a few miles of the ancient Capital. T[illegible] cost some £27 000; it contained 714 desiatines (1 desiatine = [illegible] of which 210 were under forest, 120 were arable lands, 68 under [illegible] 65 under vegetable and ordinary gardens, 22 occupied by lakes [illegible] remaining 217 by roads, buildings etc.

Since its foundation the Higher School has passed through se[illegible] different periods.

During the *first period*, from 1865 to 1873, it bore the name of "Sc[illegible] of Agriculture" and its avowed object was to spread useful knowl[illegible] relation to agriculture and forestry. It was open to all who desired i[illegible] tion in these subjects, no diploma of secondary education being r[illegible] for admission. During this period, out of 1111 students, only 158 [illegible] diploma of higher or secondary education. The normal period of st[illegible] 3 years, but students were allowed free choice of the course of stu[illegible] permitted to settle for themselves the time during which they wis[illegible] study; and were not compelled to undergo any examination. F[illegible] out of the 1111, only 82 went though the complete curriculum. I[illegible] interesting fact that of those who did pass through the full term, 77 [illegible] devoted themselves afterwards to agriculture. So far the acade[illegible] accomplished its object.

It was during this first period that there were laid and ar[illegible] developed the truly scientific foundations of higher agricultu[illegible] cation, based on a solid preparation in natural sciences during [illegible] 2 years of study. The important courses in chemistry, physics, [illegible] plant physiology, anatomy, zoology, animal physiology, and agr[illegible] chemistry, were organized by the leading professors of these scienc[illegible] included some of the most eminent scientists. This tendency [illegible] being weakened, gradually gathered strength and still constitutes [illegible] the best and most characteristic traditions of the Higher S[illegible] Moscow.

The *second period* lasted from 1873 to 1880. In the new statutes [illegible]

... of the academy was described as "scientific instruction in agri... and forestry". At the same time, the academy was transformed ... ool of Agriculture of the higher class, *i. e.* it was provided with a ...culum of studies obligatory on all students, with obligatory exa... The length of the course of studies was 4 years and admission ... to those students who possessed a qualification equivalent ... secondary education institutions.

... positive element of the new statutes consisted in a better and ...cise definition of the objects in view. Later on, there was a ... to give instruction a more practical orientation. Thus, in 1883, ...orities required that, in the special agricultural courses, m... in natural sciences should preponderate, that experimental ...ould be increased, that instruction should be more practical, the ... centering round the farm attached to the Academy itself. From ... of this year 1883, the students were required to carry out ... farming work during the summer vacations. Later on, in 1886, ...ion to the academy was made conditional on an apprenticeship ...vate agricultural undertaking.

The third period is the shortest and most unsettled in the School's exist... In 1880, the statutes were modified and the Academy of Agriculture ...estry became one of Agriculture alone.

However, it became impossible to apply the new statutes to a great ex... were in 1890, in consequence of political agitation, admission to the ...my was prohibited by the Government and for a time the school ... to exist.

The fourth period began in 1894 and still continues. Some months af... closure, the Higher School of Agriculture of Moscow was re-opened ...the name of "The Agronomic Institute of Moscow". The object of ...titute, according to the new statutes, consisted in higher agricultural ...tion and in the teaching of agricultural hydraulics. This last was a ...cable innovation. From the first years of its existence the Institute ...deavoured to accommodate itself to new requirements and had mod... instruction by enlarging the scope of existing courses, and intro... new courses of study. Thus, in 1913, a section of Ichthyology had ...ted with the object of serving as a basis for scientific instruction ...culture (which is of enormous importance in Russia) and of prepar... ...ists in this branch of work. This new department is thoroughly ...ed in all that concerns scientific material and teaching staff. ... 5 professors besides 2 acting and 7 assistant professors.

...subjoined table, drawn up by Professor PRANISCHNIKOW, shows ...development of the Institute as regards the teaching of natural ...s and compares the number of professorships in the University ...s of Natural Sciences with that in the Institute.

...above table shows that the Faculty of Natural Science (at the ...sity) has only one chair of Agronomy while the Agronomic Institute ...ow, although its instruction in natural sciences is almost the same, ...s a larger number of professors of agronomy.

Table showing Comparison between Number of Professorial Chairs . . . versity and in the Agronomic Institute of Moscow in Natural S . . .

	Faculty of Natural Science in University	Agronomic Institute of Moscow		
	Professors	Active Professors	Assistant Professors	Total
Natural sciences. Physics Meteorology Chemistry Botany Zoology Mineralogy Geology Animal Physiology	11	10	3	1
Agronomy I. Agricultural Chemistry Applied Geology Plant Breeding Sylviculture and other Branches of plant cultivation	1	6	—	6
Agronomy II. Stockbreeding and allied branches	0	3	3	6
Economy III Economic bases of agriculture	0	4	1	5
Technical Machines	1	2	—	3
Mathematical sciences. Pure mechanics Theoretical and applied mechanics Descriptive Geometry Astronomy Surveying	7	5	1	6
Rural Engineering. Special courses	0	6	1	7
Total	20	36	9	45

With regard to details of the Institute's organization, the ... of instruction and obligatory examinations at determined date... replaced by a system under which the student is permitted to cho... subject which he prefers to study. The methods of testing the k... acquired by students and their work are generally left to the ... of the professors, who hold half-yearly examinations. The num... examinations for different groups of students depends on the sco... branch of instruction selected by them. The students themselve... to decide in what order the practical experiments in the lab... or science rooms, shall be conducted, and in what order the sev... examination shall be taken etc.

In view of the great awakening of agricultural activity w... taken place in Russia during the last 10 years, the number of stud... necessarily increased considerably. Whereas, formerly, the tot... did not exceed 300, it now reaches 1500. Moreover, possess a di... higher education, *viz.* in 1914 there were 280 and in 1915 their ... was 230.

... Institute received a new and very strong impetus in the last ... ing which M. A. W. KRIVOCHEINE was at the head of the Ministry ... ture. Thus, in 1912, the number of professorial chairs was ... that while formerly there were only 21 professors and 10 assis... are now 30 professors, 9 acting professors, and 20 assistants ... expenses have risen from some £10,000 to over £22,000, ... expenditure on scientific material has increased from £3,000 ... per annum.

... law which empowered the Minister of Agriculture to open ex... stations at the higher schools of agriculture has contributed ... other scientific activity of the Institute. This law has permitted ... to the Institute of a series of new experiment stations fully ... and having in view not only educational objects but also scienti... ...ch of a general and local character. The following research ... are already at work: Plant breeding, Zootechny, Phytopa... Agricultural Engineering, Flax Culture. In a short time ... to be experimental stations for apiculture and horticulture ... station has its own staff (viz. one director with a good number of ...).

... siderable grants are allowed to the experiment stations. Some ... dy fitted with a series of laboratories, museum collections etc. ... over £10,000 was allotted to the stations. The former chairs of ... and Zootechny are being similarly developed, with the creation ... laboratories and the addition of a series of new professorial chairs. ... sometime ago, the Institute proposed to reconstruct the Forestry ... and the Minister of Agriculture proposed adding two new branches ... ...ivity to the Institute: viz. preparation of specialists: 1) for agri... ... engineering; 2) for technical chemistry (manufacture of chemical ...). These 2 branches of instruction are of exceptional importance ... Suffice it to say that there have been discovered, in the basin ... river Volga, beds containing some 500 million tons of phosphorites, ... use of chemical manures in the country is increasing yearly.

According to the figures furnished by Professor FORTUNATOW, there ... been turned out from the higher school of Moscow in the 50 years ... existence, 2,702 agriculturists and foresters (the latter numbering ... of which number 1,179 have come from the Academy and 101 ... the Institute.

... interesting feature of the students' life has been the growth of a ... spirit of association. There are at the Institute many students' ... tions with very different aims and objects: 1) a relief fund to which ... from old students may be also subscribed; 2) a student's Commis... ... the distribution of grants for study; 3) a reading club; 4) a library ... of general culture; 5) a publishing society; 6) a club of social ... with a library and a committee to which is entrusted the ... distributing residential quarters in the "zemstwo"; 7) a fishing ... forestry club; 9) a horticultural club; 10) a teachers training ... a photographic club, and so on. There are, moreover, district

societies of students which have for their aim the study of the ... and agricultural conditions of each district.

The agricultural school of Moscow has had a profound ... influence and gained the esteem of all interested in the agricult... of Russia. An esteem, says KATAEW, founded on the fact that ... has been practically an Agronomic University, always endeavou... up to its scientific mission, and taking as its basis a solid pre... natural history; counting among its professors some of the bes... and striving to turn out students not only scientifically traine... active agriculturists and good citizens.

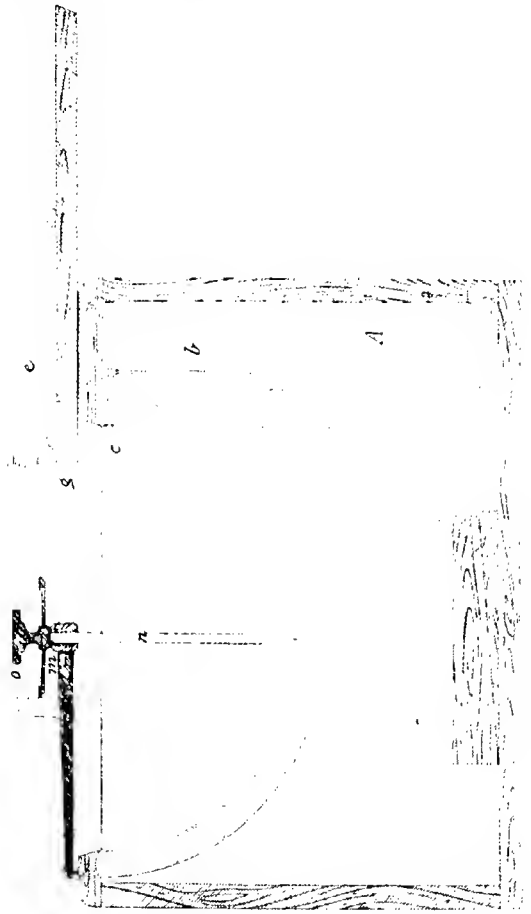
CROPS AND CULTIVATION.

(51) **The "Fredia" Dewmeter** - EREDIA, F., in *R. Accademia dei Lincei, Atti ...* (5), pp. ... 1912. Rome. 1912.

AGRICULTURAL METEOROLOGY

This is a new apparatus for measuring the fall of dew, designe... EREDIA of the Central Bureau of Meteorology, Rome. Its ... parts (shown in the figure) are as follows. A Dewar receiver in the ... an open cup with a diameter of 11.28 cm, equal to a surface ar... cm² exposed to the atmosphere. The receiver is placed in a woo... and supported on two pieces of wood which raise the cup into cont... upper rim with the fixed annular covering of the wooden box ... against the wall of the box is a clockwork action, which controls ... mechanism, the spring being attached to a fixed rod *b*, whose up... articulates with a lever having its fulcrum at *c*. The other end of th... carries a pin which acts as a stop for a movable circular cover of wood... upper surface is pressed down by the end of the spring *e* which can mov... the pivot *g* to which its end is attached. The apparatus works in ... lowing manner: when exposed in the open air, in order to obtain a ... the clockwork is wound up so that the spring attached to the ... mechanism is released exactly at sunrise; as a result, the stop of ... cular movable cover ceasing to act, this latter, pushed by the sprin... on the pivot *g* until it completely covers the opening of the Dew... over which it fits exactly. In addition, the bevelled edge of the m... cover fits exactly onto the annular cover of the box, closing it tigh... thus preventing evaporation of the dew collected at the bottom of t... in case the measurement is not carried out at once. To carry out the m... ment, the Dewar cup is uncovered by turning the circular cover to ... utmost position and a j-armed fitting is placed on the fixed circular ... tive box and its extremities fitted into split metal sockets. The tripod ... the screw *m* whose milled head *n*, on turning, moves the micrometer ... ending in a point at its lower extremity. The circle round the hea... micrometer screw is divided into 50 equal parts and moves at a tangent ... millimetre scale *p*. One complete turn of the circle corresponds to ... vision of the scale and thus the movement of the screw can be m... to an approximate accuracy of 0.02 mm. Zero on the scale corresp... the position where the point of the screw touches the bottom of th...

btain the amount of each fall of dew, the point of the screw is ad-
as just to touch the surface of the water in the cup, an easy task.



screw has only to be made to coincide with its mirror image in the

total number of millimetres through which the graduated circle has
and any fraction of a turn, indicate the depth of the water in the cup.

If h equal the depth, and R the radius of the sphere whose arc is occupied by the water, the volume of water can by calculated from the formula $V = \pi h^2 (R - \frac{1}{3}h)$. To see if the measuring apparatus is properly set, turn the screw n till its point touches the bottom of the cup and the scale should be at zero.

To avoid the above formula and to simplify the calculations the apparatus is provided with tables showing the corresponding volume of water for each volume of h.

SOIL PHYSICS, CHEMISTRY AND MICROBIOLOGY

385 - **The Displacement of the Potash and Phosphoric Acid Contained in Certain Rocks by Some Substances Used as Fertilizers.** — ANDRÉ, G., in *Comptes Rendus des Séances de l'Académie des Sciences*, Vol. 162, No. 3, pp. 133-136. Paris, 1916.

In a previous article (1) the writer has shown that the prolonged maceration, in the presence of distilled water, of a microcline felspar with different salts used as fertilisers and which are normally present in the soil caused the liberation of a certain amount of the potash contained by the felspar. The nutritive solutions present in arable soil are derived in part from this double decomposition which is the more thorough the finer the state of division of the solid elements.

The writer has continued this study on glauconite (a hydrated silicate of iron and potassium) which varies considerably in composition according to its origin. The sample employed by the writer contained 7 per cent of potash. The samples of 10 gms. were ground and passed through sieve N° 70, after which they were well pulverised for 130 hours in the presence of 1 gm. by weight of different salts

The results obtained are given in the following table:

Salts added in presence of water	Potash (K_2O) yielded to solution		
	grammes	In 100 parts by weight of glauconite	As percentage of total potash contained in glauconite
None	0.0230	0.23	3.71
Calcium carbonate	0.0402	0.40	6.47
Sodium chloride	0.0398	0.39	5.71
Sodium nitrate	0.0508	0.50	7.31
Ammonium sulphate	0.0706	0.70	9.47
Calcium sulphate	0.0394	0.39	5.71

Considerable quantities of potash were thus set free, the amounts being comparable to those obtained from microcline felspar. The sodium chloride and especially the nitrate of sodium, had a stronger action in this

(1) See *B.* February 1914, No. 90

...e potash of the glauconite than upon that of the felspar. The same ... of felspar yielded, in the same time, only 3.25 and 3.21 per cent ... contained potash. The action of calcium carbonate is more ... upon glauconite than upon felspar. The potash liberated from ...spar by the same agent only amounted to 2.38 per cent of the total ... content. The same may be said of the action of calcium sulphate. ...ximum potash displacement was obtained in the presence of ammo... sulphate, when it amounted to nearly 10 per cent of the total potash. ...nium sulphate had given a similar result in the case of the felspar, ... potash displaced was a little less (7.38 per cent). Thus the amount ... potash dissolved out from very finely ground glauconite is larger ... that obtained from felspar, and the part which this mineral may ... as a potassic fertiliser is far from negligible.

In order to put the conclusions derived by this method on a broader ... attention was next paid to apatite. The object was to ascertain ... amount of phosphoric acid capable of being removed by double ...position when powdered apatite is ground in the presence of water ... certain soluble salts used as fertilisers. Apatite is considered to ...sent a form of phosphoric acid which can only be assimilated by ... with great difficulty, on account of its crystalline structure, hard... and very slight solubility under the conditions under which it occurs ... soil as a result of the disintegration of the primitive rocks.

Four experiments were made in each of which a powdered Ontario ...te (containing 39.33 per cent of phosphoric acid) was subjected to vigo... grinding for 134 hours in the presence of water and of 1 gm. by weight ...e following substances: ammonium carbonate, sodium nitrate, potas... carbonate; these substances being chosen from the compounds met ... in the soil. After grinding, the mixture was filtered, washed with dis... water and the filtrate examined for phosphoric acid. The result was ...ive in the case of the ammonium carbonate, although during grind... fresh additions were made of this salt, on account of its volatility. ...itive results were also obtained with the nitrates although, according ...rtain workers, *precipitated* tricalcic phosphate should be slightly soluble ...e presence of these salts. On the other hand, the potassium carbo... displaced a certain amount of phosphoric acid, 0.0130 gms. P_2O_5 ... gms. of apatite, which corresponds to 0.35 per cent of the phospho... acid present in the original material. This confirms the statement of ... writers, who consider that potassium carbonate acts as a solvent ...e tricalcic phosphate in the soil. The addition to farmyard manure ...certain quantity of tricalcic phosphate has often been considered ad...ge since the ammonium carbonate produced by the fermentation of ...anure has been regarded as capable of dissolving a small amount of ...phosphate. The experiment here described shows that scarcely any ...ic phosphate is thus dissolved, this is also in agreement with practi... observation; the operation is consequently of little advantage to agri...re.

METHODS OF SOIL CULTIVATION

386 – **Improved Summer Fallowing.** HITIER, H. in *Comptes Rendus de l'Académie d'Agriculture de France*, Vol. II, Year 1916, No. 3. Paris, 1916.

M. HITIER reports upon a pamphlet by Count ALFRED DE [illegible] *La méthode de Culture JEAN*, which is the result of an enquiry ordered [illegible] Union du Sud-est des syndicats agricoles on M. JEAN's method [illegible] which consists essentially in :

1. – Exclusive use of the cultivator or Canadian harrow, [illegible] doing away with the plough.

2. – One-crop farming of cereals simply interrupted from [illegible] time by a forage crop, thus obtaining extreme economy of equipment duction of teams and great saving of labour.

One bullock driver kept during the whole year and one for the [illegible] intervening between harvest and seeding time, together with some [illegible] hands for threshing are all that are needed for 55 acres of cereals. M. [illegible] at his estate of Bru, Commune of Cavanac near Carcassonne in the partment of Aude, has successfully practised this system for the last [illegible]

As soon as the grain is cut and stooked, and before it is carted [illegible] the stubbles are immediately worked over with a cultivator so as to [illegible] loss of moisture by capillarity and to favour the aeration of the soil promoting microbiological activity. Riding cultivators fitted with [illegible] teeth and levers for regulating the depth of work are used ; the first time great depth need be attained, it is sufficient just to loosen the surface form a dust mulch which will diminish capillarity and absorb any or dew which may fall, thus rendering easier the next dressing with the tivator which is given 10 or 15 days after the first, and, where possible across it, with larger triangular blades if the flexible spring teeth are strong enough.

Every 10 or 15 days the cultivator is drawn over the fields, till [illegible] time, each time increasing the depth of loosened soil by an inch or two. soil being kept moist by the mulch will not demand much more power the greater depths, while at the same time the whole field gets complete freed from weeds.

This system is especially recommended for regions in which a period elapses within harvesting and sowing, such as the South-west South of France.

MANURES AND MANURING

387 – **Green-Manuring in India** (1). – DOBBS A. C., in *Agricultural Research Institute Bulletin* No. 86, 55 pp., VI Plates, 1 Diagram. Calcutta, 1918.

The use of vegetation of all kinds for manure (usually leaves and [illegible] collected and transported to the fields) when it could not be turned to better account, has been perfectly familiar to Indian cultivators from immemorial. Green-manuring (the turning in and burial of the crop in the soil upon which it has grown), however, though not unknown in the country, has not been nearly so widely distributed as it should been.

(1) See *B.*, February 1916, No. 147.

The attention of the Agricultural Department has long been turned to this important question, and as early as 1882, experiments were made at Cawnpore in green-manuring at Cawnpore, followed by others at Nagpur [illegible] while dating from 1905, field experiments were carried out in almost every Province of India. Important laboratory experiments were made in Madras, Assam, and at Pusa. The above-mentioned Bulletin is a compilation of all the reports relating to this work, and of articles appearing in other publications, and serves as a general report of the results hitherto obtained. It also gives a short sketch of the work which is being carried on in this direction at Pusa, and at some of the most important experiment stations of some provincial centres.

The question of green-manuring in India presents special difficulties, owing partly to the climate, and partly to the economic conditions obtaining there. The drought that prevails for half the year over the greater part of India is succeeded by the hot damp period of the monsoon. The length of the dry season prevents the formation of permanent pastures of Leguminosae and necessitates continual cultural operations, which as is well known, exhaust the organic matter of the soil. During the monsoon, a great luxuriance of vegetation is promoted which might be expected to redress the balance. That it does not do so, appears to be due principally to three causes:

1) The use for fuel (which is very scarce) of all spare organic matter, including cattle dung, and as much as is not required of the stems of such crops as occupy the ground for the whole of the monsoon season.

2) Insufficiency of rainfall in many districts, which precludes the profitable cultivation of both a full monsoon crop and a cold weather crop on the same land.

3) The growth, for food purposes, of crops like rice which yield a relatively small proportion of straw to grain, and while occupying the land for only part of the monsoon, yet leave insufficient time, during the remainder, for a second crop to mature; with the result that the ground frequently left fallow or uncultivated.

In order for green-manuring to be advantageous, the crops used must not take the place of other crops of primary importance (forage, fuel) or interfere with the cultivation of main crops. The advantages of green-manuring depend, as a rule, upon the utilisation of a shorter or longer period of the monsoon during which the ground might otherwise be uncovered. Thus the various systems of green-manuring are conveniently classified according to the length of this period, that is, according to the time of sowing or planting the main crop for which the manuring is regarded as preparation.

1) Main crop *rice*, transplanted usually about six weeks after the first monsoon showers.

2) Crops (like *tobacco* in Bihar) which are planted at the end of the monsoon, and the cultivation necessary for which precludes the maturing of a monsoon crop; and valuable cold weather crops which require the con-

servation of a considerable part of the monsoon rainfall for the [illegible] of a full yield.

3) *Sugarcane, jute* and *garden crops* which are sown at [illegible] ning of the hot season on un-irrigated land.

4) Other *crops grown on irrigated land* and which are thus [illegible] extent independent of the monsoon.

Rice. — The most important recent development of green-[illegible] in India has been in connection with the rice crop. Experience has [illegible] that the most economical way of growing rice and the method almost [illegible] versally adopted in India, is to sow the seed in a seed bed and to transplant the seedlings in puddled land, when sufficient water has been accumulated. The interval between the first monsoon showers and the transplanting of seedlings can be profitably utilised for the growth of a green manure crop. Under favourable conditions, the seed of the latter can be sown even before the end of the preceding cold weather, and the young crop will survive the hot weather and be ready to take full advantage of the early part of the monsoon.

Plants which have been successfully used for green manure in [illegible] different provinces are: *Crotalaria juncea, Phaseolus Mungo, Dolichos [illegible] florus, Sesbania biflorus, Sesbania aculeata, Tephrosia purpurea, Melilotus alba, Lathyrus sativus.*

Tobaccos and valuable cold weather crops for un-irrigated Land. — Green-manuring for these crops differs from that in practice in connection with rice, from the fact that the manure cannot be puddled in, and therefore requires a long time to rot; on the other hand, there is a longer time available before the land is required. The green manure crop can be sown on the early rains in May and ploughed in as near July 15 as possible, the tobacco being transplanted 8 weeks later. The following plants have been used with good success for green manure: *Crotalaria juncea, Dolichos Catjang, Sesbania aculeata* etc.

Jute, Sugar Cane and Garden Crops. — The growth of a crop for green manure is out of the question on typical jute land, but in parts of the Rangpur, Pabna and Mymensingh districts, *Crotalaria juncea* is sown in October and ploughed in as green manure for the jute crop, though in most cases the stems and tops are removed for various purposes, and only the roots are left in the ground. As green manure for the sugar cane are chiefly used: *Tephrosia purpurea, Crotalaria juncea, Guizotia abyssinica*; for betel-vine *Sesbania aculeata*; for ginger, the leaves of nux-vomica (*Strychnos Nux-vomica*) and those of *Phyllanthus Emblica*; for onions, garlic etc. *Crotalaria juncea.* In the Punjab, *Cyamopsis psoraloides* is used in addition to the latter plant.

Irrigated Crops. — The green-manuring crop (especially *Sesbania aculeata*) is grown during the warm season, while the principal crop is cultivated in the autumn-winter season.

. **Seeds and Plants imported into United States, 1913.** — In *U. S. Department of ... Bureau of Plant Industry, Inventory* No. 34, pp. 5-47, Plates I-VI, and ... pp. 5-68, Plates I-VIII. Washington, September-November 1915.

These inventories published periodically by the Bureau of Plant Industry at Washington are intended to form a complete record of the thousands of new and more or less valuable plants introduced into the United States.

The dangers from the introduction of plant diseases and the great expense of this work to private firms led the United States Government to undertake the responsibility of this work which concerns the general welfare of the nation.

Descriptive and bibliographical notes are appended to the various introductions and where possible, cultural observations from the place of origin.

I. — Nos. 34 728 to 35 135. The explorer in charge draws special attention to the following plants introduced during January 1 to March 31, 1913.

Avocado pears (*Persea americana* Miller), from Mexico:

No. 34 855 from San Pablo, Campeche, a thin skinned fruit with small seeds; reported to be of very superior quality.

No. 34 850 said to be the finest and largest fruits in Merida, a place noted for its fine avocados.

No. 34 831 from the Pincio gardens, Rome.

No. 35 121 from Caracas, Venezuela; yellow skinned variety of very fine flavour; altitudes of 1400 metres with low rainfall.

Breadnut tree (*Piratinera dicastrum*, Baillon)

No. 34876 from Merida, Mexico, branches used as fodder in dry season. Hardy ornamental shrubs suitable for the trying climates of the Great Plains.

Corylus — *Cotoneaster* - *Lonicera* *Populus* *Prunus* - *Tamarix*:

Nos. 34 784 — 34 805 from Novospassko, Russia.

Forage grasses:

No. 34 807. *Poa pallens*, resembling Kentucky blue grass, from Buenos Aires.

No. 34 815. *Eragrostis superba* Pyritsch from South Africa. One of the best native pasture grasses on the high veldt 3500 to 5500 feet; common sandy soils in British Bechuanaland with rainfall not more than 10 inches.

Stevia rebaudiana (*Hemsley*):

No. 34 883 from Paraguay; herbaceous perennial, leaves containing a glycerin many times sweeter than sugar.

Papaya:

No. 34 777 from Merida, Mexico, very large fruits.

No. 34 903. fruits of enormous size on trees 7 feet high; probably of value on account of high yield of papain.

Chinese plum:

No. 34 851. *Prunus brigantina* from Nice, France.

No. 35 133. Chinese Yangtaw. *Actinidia chinensis*, female vine from Chelsea, London.

Persimmon: (*Diospyros kaki*) from Okitsu Japan:

No. 34 970. Fruit medium size, average weight ½ lb., round and flat, firm, not very juicy, of very good quality after removal of astringency.

No. 34 971. Fruit medium large, more or less oblate; flesh fine, juicy, of very good quality when the astringency is removed.

No. 34 972. Fruit large, 1 lb or more, conical in form; flesh fine, tender, very little more or less astringent at first, but very sweet when soft, suited for dried fruit.

No. 34 974, from Hiroshima Japan. This variety produces the best dried persimmons in Japan.

"Sacred Ear Flower" (*Cymbopetatum penduliflorum* Baillon):

No. 35 039, Imported from Guatemala. Anonaceous plant dried flowers used to flavour chocolate.

Kerstingiella geocarpa, Harms:

No. 34 919 to 34 923 from Togoland, Africa. An edible bean which matures under ground like the ground nut.

"Olanamba" (undetermined):

No. 34 913, an edible root from Angola used in place of potatoes.

Kafir corn: *Holcus sorghum* L.

No. 34 911, from selected seed, with large white grains and drought resistant.

II. Nos. 35 136 to 35 666, introduced between April 1st and June 30th 1913.

Chinese Hawthorn (*Crataegus pinnatifida*):

No. 35 136 from Tsiman, Shantung, China; a large fruited variety, hardy and drought resistant; fruit of good flavour and makes a unique preserve.

Wild Pear (*Pyrus ussuriensis*):

No. 35 301, from Harbin, Manchuria, probably the hardiest of the genus; fruits small and inedible; useful in breeding experiments.

Grape hybrid (*Vitis amurensis* × *V. riparia*):

No. 35 305, obtained by M. Mijurin, Kozlof, Tambof, Russia; fruits small, good flavour.

Mountain Ash (*Sorbus aucuparia* L.):

No. 35 305, from same source as preceding; fruits pleasant and sweet.

Red currants (*Ribes* spp.):

Nos. 35 308 and 35 309, from Krasnoyarsk, Siberia; very hardy.

Hazlenut (*Corylus mandshurica*):

No. 35 288, Maxim from Harbin, Manchuria, very resistant to cold and drought. Shells very thick and hard, kernels small. Useful in breeding experiments.

Jujube (*Ziziphus jujuba* Miller):

No. 35 253 from Lioling, Shantung, China; seedless or with soft edible kernel; ringed or girdled to increase the crop.

No. 35 255 – 35 001. The scarlet jujube; fruits the size of small eggs.

No. 35 440. *Ziziphus vulgaris* Poir. introduced as a stock for *Ziziphus jujuba* in the tropics.

... (*Juglans regia sinensis*):

... 35,015 to 35,017, 3 varieties from Shantung and Peking.

... (*Cucumis melo* L.):

... 35,035 to 35,037 from Liaoning, Shantung, thirteen varieties of seed. Very sus... environmental changes. It is recommended that the first two fruits selected ... shall be kept for seed.

... tree" (*Cudrania tricuspidata* (Carr.) Bureau):

... 35,038 from Liaoning, Shantung; a small shrub or tree, leaves used for feeding silk... time of scarcity. Similar to *Osage orange*; suitable as a hedge plant, fruit sweet ... do.

... (*Dioscorea tuberosum*):

... 35,040 to 35,057, 17 varieties from Chile, in Peru, including several new forms and ... called yellow potato of Peru.

... (*Carica papaya*):

... 35,058 to 35,060 from the Belgian Congo and Nos. 35,111 and 35,112, *Carica ... ensis* Hooker f. from Nice, France; the mountain papaya.

... (*Trifolium* spp.):

... 35,205 to 35,209 from Bogorodsky Experiment Field, Kursk, Russia, 5 species ... including *T. resupinatum*, *T. incarnatum*, *T. pratense*, *T. alexandrinum*, *T. repens*, *T. hybri...*, *T. monstrosum*.

... (*Vicia* spp.):

... 35,210 to 35,218, five species received from Weibull, Stockholm, including *V. ... villosa*, *V. dasycarpa*, *V. multijuga*, *V. sinensis*.

... (*Inga edulis*):

... 35,446 from Los Banos, Philippine Archipelago, termed the common Philippine ice... cream bean, palatable, suitable for moist, hot countries.

Manihot spp.): from Buitenzorg, Java.

... 35,505 to 35,512 including *M. aesculifolia* Lam.

... "Soap-nut tree" (*Sapindus acuminata*):

... 35,522 *Sapindus acuminata* from Sydney, Australia.

... oak (*Pasania cornea* Oerst.):

... 35,529 *Pasania cornea* Oerst. from Hongkong, China; acorns edible.

... varieties (*Gossypium*):

... 35,535 to 35,537, from Southern Nigeria.

... (*Onobrychis vulgaris*):

... 35,545, from Siberia, suitable as late fodder in dry regions.

... (*Medicago falcata*):

... 35,546 from eastern Russia; 35,547 yellow flowered, improved, from Western ... Siberia.

... orange (Berne Late):

... 35,547 from Algiers, very solid skin, exported from Murcia, Spain, during the ... June.

Medjool Date (*Phœnix dactylifera* L.):

No. 45150 from Morocco.

Raspberry (*Rubus biflorus quinqueflorus* Foke):

No. 45157 from Szechwan, China, golden yellow fruit of great flavor and vigour.

Tropical Maize (*Zea mays chloricon*):

No. 45158 from Tampico, Mexico; seed of dish-rank collected [illegible]

596 **Habitual Presence of a Micro-organism in the Roots of Cruciferæ.** [illegible] Nov. 3, pp. 173-178. Dec. [illegible]

The writer records the presence of a micro-organism [illegible] Cruciferæ living habitually on the roots and observed by him [illegible] of mustard, turnip and horse-radish. These micro-organisms [illegible] ticularly on the swellings which are often observed at the [illegible] the secondary roots emerge. They are of the bacillary [illegible]

Further experiments will be necessary to determine whether [illegible] organism, which culture experiments have shown cannot be [illegible] with *Plasmodiophora*, has the faculty of fixing atmospheric nitro[illegible] far, it has been demonstrated as belonging to the oligonitrophi[illegible] hypothesis which is founded on the supposed capability of [illegible] fix atmospheric nitrogen and so explains their beneficial action [illegible] manures, is therefore not devoid of foundation.

596 **Variations in Mineral Composition of Sap, Leaves and Stems of the Wild-Grape Vine and Sugar-Maple Tree.** Shutt, F. T. Chemist, Kentucky Agricultural Station in *Journal of Experimental Research*, Vol. V, No. [illegible] pp. [illegible] Washington, D. C. December 20, 1920.

During the last three years, samples of the sap from the vine (*cordifolia*) have been collected and analysed to determine (1) whether the mineral composition of the sap varies in different parts of the vine at the same time; (2) whether it varies during a single season in the case of the vine; and (3) whether it varies during different seasons.

The results of the analysis show that the water, calcium and [illegible] content of the sap are fairly constant when collected at two different [illegible] at the same time during the same year, while the silica, iron, alumina, potassium, phosphorus and chlorine are the large variable constituents depending upon the time and point of collection. More organic matter is found in the sap at a point on the main branch 20 feet from the [illegible] is found closer to the ground or on new branches. The silica, iron, aluminium, calcium, magnesium and sulphur however, are found in greater quantities in the new branches, thus showing that the minerals accumulate in the leaves. Certain constituents, viz.: silica, iron, aluminium, magnesium and phosphorus, may be about the same in the sap when collected from two different parts at the same time, but vary widely when collected the following season. A further point of interest is that while the ratio of lime to magnesia is fairly constant for different parts of the season, that of potash to soda is variable.

examination of the sap at different times of the year shows a concentration of minerals towards the end of the sap flow, or when new leaves develop, compared with the beginning of the new year. The order of magnitude of the variations in the various constituents is as follows: potash, chlorine, iron, aluminium, silica, phosphorus, sulphur, magnesia, soda and calcium.

A considerable variation in the mineral composition of the sap occurs in different periods of the day, an increase generally being found during the day and a more constant composition during the night.

The variations in the composition of the sap of the sugar maple tree were also determined.

The mineral content of the sap was higher in 1904 than in 1903, the greatest variations being with the sulphur and phosphorus. Comparing the ash of the maple sugar with that of the water maple, large differences in the mineral constituents were found, and the large variations in the ratio of lime to magnesia and potash to soda show that these differences are due simply to the dilution of the sap by water in the soil.

The Effect of Heating Seeds upon the Development of the Plant. Experiments made in Russia with Wheat. — WOROSCHIN S. J. (WOROSCHIN), Professor of Agriculture in the Polytechnic Institute of N. Nowo-Alexandria, Kieff, Russia, December 21, 1904.

The very limited number of observations regarding the action of different gases upon the plant previous to the vegetative period induced the author to undertake, at the Kieff Polytechnic Institute, experiments with the view of determining the effect of somewhat high temperatures, not upon the growing plant but upon the plant embryo. This heating is compared to the artificial drying of the plant while still in an embryonic condition.

The experiments were carried out in pots with seeds of hard wheat (*Triticum durum*). In one set of pots the "Arnautka" variety was sown (a seed commonly used was taken in this case; this is a mixture of different varieties), while in the remainder were planted seeds of a pure race belonging to the "Kouban ka" variety.

The amount of water given to the pots was: for 50 per cent of the total amount required to saturate the soil. The seeds were subjected to heating for 20 minutes at a temperature of 80° C. The effect of heat upon the germination of the "Arnautka" seed may be summarised as follows: Generally speaking, the germination capacity is not diminished (68 per cent against 90 per cent), but in the case of the unheated seeds, the maximum germination (90 per cent) occurs on the fourth day, while in that of the heated seeds the maximum germination (37 per cent) is observed on the sixth day. The seeds used were from the harvest of the preceding year. Determinations of the germination capacity of grain harvested 2 years previously gave very different figures; that of the unheated seeds being 37 per cent, and that of the heated 63 per cent. The germination capacity of grain from a harvest spoilt by rain decreased still more, of the unheated seeds of such a crop, 70 per cent germinated and of the heated seeds 30 per cent. High temperatures, therefore, have a distinctly injurious effect upon

the embryos of old and spoilt grain, while they do no harm to g[illegible] vested in normal weather.

The numerical results of these experiments are summarise[illegible] appended table

As regards the experiments with the variety "Arnaoutka" being a pure line, the results are too variable for any definite co[illegible] to be drawn. This shows once more the necessity for using seeds [illegible] lines in experiments of this kind.

In the case of the pure line, on the contrary, the differen[illegible] the yield from similarly treated pots is very slight, never exceed[illegible] cent.

A tendency towards increased yield is observed in the case [illegible] grown from heated seed, whatever may be the degree of the da[illegible] the soil. It is interesting to note that heating the seeds gave the [illegible] sults where the soil received the smallest amount of water. Thus [illegible] same total yield (10.52 gms.) the pots sown with heated seed (N[illegible] produced 7.12 gms. of grain, while the plants grown under simil[illegible] tions, but from unheated seed, produced only 6.37 gms. of grai[illegible] seen, on comparing other data, that heating increased the yield as [illegible] with 20 per cent of the total amount of water required for the [illegible] of the soil, 11.70 per cent; with 40 per cent of this amount, 8.2 per [illegible] with 60 per cent, 5.1 per cent. It results from these figures that [illegible] the plants receive a large amount of water, heating the seed previo[illegible] sowing only increases the yield to an insignificant extent, and vice [illegible]

It may be taken that this increase is due to the fact that plants [illegible] from heated seeds, and which have grown without the necessary [illegible] of water, undergo some kind of structural modification; they are [illegible] height only 710 mm. against 818 mm. for plants from unheated seed [illegible] leaves of the former weigh 27.6 per cent of the weight of the seed [illegible] N[illegible] 11 and 12), while those of the second weigh 32.9 per cent (pots [illegible] and 6). The plants grown from unheated seed, having more leaves [illegible] less seed (both as regards absolute weight and relatively to the w[illegible] of the seed); the assimilating apparatus of these plants, being less [illegible] would be less productive. In support of this hypothesis, a table is [illegible] embodying the results of research on leaf anatomy. These show [illegible] heating seeds occasions the formation of tissues with smaller cells [illegible] length of the stomata and the dimensions of the mesophyll cells [illegible] lower values in the case of plants obtained from heated seed, and under conditions where soil humidity is 40 per cent and 20 per cent of total capa[illegible] tion; great humidity of the soil (60 per cent), equalises the qualitative [illegible] racteristics of the tissues.

The writer concludes that heating has a great stimulating effect [illegible] the embryo and promotes in the plant a tendency to xerophytic [illegible] ture; this is shown in its reduced height, in the decrease in the relative [illegible] weight of the leaves and in the dimensions of the cells. Seeing that xero[illegible] philous plants best withstand want of water, it can be considered that [illegible] places where water is abundant, heating the seed produces no [illegible]

Experiments on the Effect of Heating Seed-corn on the Growth of Crops.

	No. of pot	Height of plant in June	No. of ears and weight of straw per pot: Grain: per pot	average	Straw	Total: per pot	average	Weight of corn per 100 ears	average	No. of ears per pot and weight of straw per pot	average	Amount of water per cent. per cent. of total saturation of soil
A.—Mixed with Clay (Loamy Clay to Loam in Pots)												
Unheated seed	100	0·55	18·50	18·52	34·50	53·00	52·12	18·50	18·05	166·0	97·1	60 %
	101		18·55		32·50	51·25		17·60		94·5		
	102	0·11	13·00	15·00	24·10	37·10	41·55	12·10	13·50	93·0	89·2	40 %
	103		17·00		29·00	46·00		14·90		85·3		
	104	0·53	11·07	8·05	21·00	32·07	18·30	5·30	4·25	36·8	51·8	20 %
	105	8·52	7·07		8·05	15·00		4·20		66·7		
Heated seed	106	0·15	13·20	10·07	27·00	43·10	45·00	14·82	13·00	97·5	97·45	60 %
	107		19·03		20·07	39·10		10·50		97·4		
	108	0·22	11·02	13·01	27·08	41·02	37·08	13·00	12·09	84·0	86·0	40 %
	109		15·25		20·50	35·75		11·00		88·0		
	110	7·0	10·00	10·28	11·50	21·50	22·02	5·00	5·50	50·0	56·4	20 %
	111		10·55		15·20	25·75		6·00		62·8		
B.—Planted in Earth Kept Moist												
Unheated seed	1	0·85	19·07	19·75	30·00	49·07	47·15	14·50	14·50	74·0	73·9	60 %
	2		20·44		29·00	49·44		14·50		72·0		
	3	0·25	18·31	17·75	18·50	36·81	30·80	10·50	10·47	66·5	66·0	40 %
	4		18·00		12·50	30·50		10·44		53·5		
	5	1·8	0·25	0·3	1·50	1·75	10·52	2·50	2·50	32·0	32·0	20 %
	6		0·50		1·50	2·00		2·50		32·0		
Heated seed	7	1·0·0	20·07	20·85	29·00	50·07	50·50	15·10	15·00	72·0	73·8	60 %
	8		20·7		24·50	50·20		14·50		74·5		
	9	0·0	19·05	20·10	29·10	48·15	49·52	10·20	10·50	66·5	64·1	40 %
	10		19·35		20·50	39·85		10·80		61·8		
	11	2·10	2·10	2·12	3···	15·45	16·52	4·00	4·00	28·7	27·0	20 %
	12		2·14		3·45	15·59		4·00		25·0		

tion in the structure of the plant, while where water is somewh[ ] heated seeds produce plants with modified structure for the pur[pose] abling them to withstand drought.

302 — **Hourly Transpiration on Clear Days as Determined by Cyclic Environ[mental] Factors** — BRIGGS, L. J. and SHANTZ, H. L. (Biophysicist and Plant Physi[ologist] of Plant Industry, in *Journal of Agricultural Research*, Vol. V, No. [ ] pl. 6, VIII, LV. Washington, D. C., January 3, 1916.

These transpiration experiments were carried out at Akron, Co[lorado] 1912-1914, with a view to determining, as far as possible, the relative [ ] of various environmental factors on the transpiration of differen[t] The plants, which included wheat, oats, rye, sorghum, alfalfa and [ ] thus, were grown in large scaled pots of the type used in water requ[irement] experiments (1). The environmental factors were recorded in terms [of] lar radiation, air temperature, depression of wet-bulb thermometer [and] ration from free water surface and wind velocity.

The transpiration curves of the various plants may be grouped [into] classes: 1) those showing a flattening of the curve in the forenoon [ ] companied by corresponding changes in the environmental factors [ ] those showing no such change. The cereals belong to the former [ ] and the forage plants and amaranthus belong to the latter.

The change in the transpiration curve of the cereals appears to be [due] to some change in the plant resulting in a reduction in the transpir[ation] rate below what would be expected from the form of the curve during [the] early hours of the morning. The hourly transpiration rate of the [ ] on clear days increased steadily, though not uniformly, from sunris[e] maximum value which was reached between 2 and 4 p. m., after wh[ich] fell rapidly to the night level. The transpiration graphs for sorghum alfalfa and amaranthus were somewhat more symmetrical with respe[ct] midday, reaching their maximum between noon and 2 p. m., after wh[ich] they fell approximately with the radiation.

During the night, transpiration at Akron is very low, being [ ] 3 to 5 per cent of the transpiration during the day light hours. The [ ] ation intensity rises in advance of the transpiration when the values [are] expressed as percentages of the maximum and falls either in advance [of] transpiration, or with it, according to the plant considered. Radiation [may] therefore be looked upon as the primary causative factor in the [ ] changes.

The transpiration graphs usually rise and always fall in advance of temperature.

Computation of the correlation coefficients between transpiration [and] the various environmental factors show the radiation, air temperature [and] wet-bulb depression to be correlated with transpiration approximately [to] the same degree, the figures being:

radiation coefficient	0.82 to 0.89
temperature	0.77 to 0.86
wet bulb depression coefficient	0.73 to 0.85

(1) See B. Bot. I, p. [ ] N. 2.

The squares of the coefficients indicate the amounts of transpiration ... ed by the several factors. Thus radiation determines the transpi... to the extent of from 0.67 to 0.77. The remainder 0.33 to 0.23 is ... to other factors and since the squares of the coefficients for these ... exceed this amount, it follows that these factors are also intercorre... with the radiation. This conclusion is supported by the much lower ... coefficients for temperature and wet-bulb depression obtained ... the night when radiation is nil.

Though the observed and estimated evaporation rates are in satisfac... agreement this is not the case with transpiration, the value as esti... by the method of least squares being greater than that actually ob... This indicates that the plant undergoes changes during the day ... modify its transpiration rate. These results therefore support the ... sions of other workers that plants under conditions favouring high ... ration do not respond wholly as free evaporating systems, even if ... supplied with water and no visible wilting occurs.

Carbohydrate Transformations in Sweet Potatoes [1]. By Harry Burkett ... Hawkins, I. A Plant Physiologists, Fermentation Investigations, Bureau of Plant ... stry in *Journal of Agricultural Research*, Vol. V, No. 14, pp. ... Washington, ... December 27, 1915.

It has previously been noted that the sugar content of sweet potatoes ... is comparatively low while they are in the ground, but that immedia... after the roots are harvested, there is a transformation of starch into ... which takes place more rapidly at that time than at subsequent per... This sugar formation thus appears to be a phase of the carbohydrate ... bolism of the sweet potato which is initiated under certain special ... tions.

Experiments have therefore been carried out to investigate this process ... fully. Determinations were made of the carbohydrate transformations ... place during a period of 10 or 12 days immediately after unearthing ... potatoes and at a second subsequent period. The potatoes were kept ... temperatures of 30°, 15.5° and 5° C.

The rate of starch conversion was found to vary with the temperature ... at 15.5° to 30° the process soon approaches its maximum. The ... accumulation of cane sugar varies with the temperature, being very ... at 30° during the first 10 days, then rapidly diminishing. At 5°, little ... sugar is produced during the first 10 days, but the rate of accumulation ... quently increases rapidly. The formation of reducing sugar at 30° ... ficiently rapid to provide all that is used in respiration and allow a con... erable accumulation, but less than that at 5°. At the lower temperature ... is a marked accumulation of reducing sugar at first which may be ... wed by a slight subsequent loss. The diminution in the production ... reducing sugar during the second period at 5°, notwithstanding the con... ued conversion of starch, and the large increase in cane sugar during this ... od, suggests that the excess of reducing sugar is converted into cane

[1] See *B.* March 1916, N. 282. *Ed.*

sugar. Also, the concentration of reducing sugar always remains comparatively low, even at low temperatures when respiration is reduced to a minimum. It appears therefore, that with the exception of the sugar used for respiration, the reducing sugar is transformed into cane sugar as fast as it is formed from starch. Probably the series of reactions is reversible and the final equilibrium between the starch, reducing sugar and cane sugar depends on the temperature, with the effect that at low temperatures the system permits a greater concentration of sugar than at higher temperatures. This would also account for the rapid transformation immediately after lifting the roots.

The initiation of this transformation coincides with the cessation of the flow of reserve materials from the leaves and occurs in potatoes left in the ground after the haulm has been cut. It is therefore concluded that the activity of the haulm inhibits the conversion of starch to sugar in the growing sweet potato.

901 **Inheritance of Length of Pod in Certain Crosses.** — Belling John, Botanist, Florida Agricultural Experiment Station in *Journal of Agricultural Research*, Vol. V, No. 10, pp. 405-420, Washington, D. C., December 6, 1915.

The Florida velvet bean (*Stizolobium deeringianum*) and the yellow velvet bean (*S. niveum*) have one main genetic difference affecting pod length, and this genetic difference segregates in genetic fashion. It is a simple dominant and acts as a multiplier with a value of about 1.52. There are also minor factors for pod length which also act as multipliers with a combined multiplying value (when double) of about 1.42.

905 **New Varieties of Plants on Sale by Vilmorin Andrieux Paris.** — [illegible] in *Journal d'Agriculture Pratique*, Year 80, No. 2, pp. [illegible], 3 figs., Paris, January 13, 1916.

Among the new varieties of plants for cultivation placed on the market by Vilmorin-Andrieux of Paris, the writer draws special attention to the three following:

1) *Very early black hybrid oat.* This interesting spring variety was obtained some 10 years ago at Verrières by crossing the Australian oat with the Joanetto oat; it has recently been subjected to rigorous selection and is now well fixed. Height 3 to 4 feet, according to conditions of cultivation. It is vigorous and stools well. The panicles are well filled and the spikelets contain 2 or 3 grains, slightly bearded. When sown at the beginning of March, it comes into ear early in June and ripens about the 20th of July, i. e. 8-10 days before the earliest varieties. It thus unites three qualities: extreme precocity, abundant yield, resistance to rust and to lodging.

2) *Jerusalem artichoke*, obtained in the Verrière experiments. A bust variety doing well in poor soils, except in those which are impervious or too wet. The tubers, which are tinged with rose and regular and even in shape, do not freeze in the ground and so can remain and be lifted as required. They can be used as food for man or beast.

3) *Chicory* (Chicorée à café). A vigorous plant, leaf entire and somewhat flattened, very regular in shape, 10 to 12 inches in length.

...on of dry matter and very pure, thanks to the high content of cu... ...ges and slight quantity of inorganic matter. It offers the double ...ge of a high yield and small fuel requirement for preparation

Plant Breeding in Cuba. EARLE, U.S. and Professor WILSON, in *Jn. J* ... 3, Vol. XLV. (1911) pp. 455-505, 2 figs. W.-S. section, D. October 25th.

...t breeding in Cuba was begun in 1901, the year in which one of ... ...ers, was called to the island to organise the Government Agricul... ...xperiment Station at Santiago de las Vegas.

...turally enough, the most important cultures were the first to re... ...ttention. The testing of seedling sugar canes has been carried on ... ...past ten or twelve years at the Harvard Experiment Station, at ... ...near Cienfuegos. As the soils of the Soledad district do not give ...factory results with chemical fertilisers, and stable manure is out of ...question, the problem to be solved was the production of a sugar-cane ...a good yield even in exhausted soil. A satisfactory solution has been ...ed. In addition to the production of seedling canes which will main... ...a profitable yield on poor soils, an effort has been made to obtain by ...s of selection, strains which will be resistant to root rot, a disease sup... ...d to be caused by *Marasmius sacchari*. On virgin timber lands in ... ...canes will often continue to give profitable results for twenty or twen... ...ve years without replanting; after this the plants die out, and must ...planted every third or fourth year. The cane usually begins to die ...tain spots in the field where the growth is weakest and the disease ...ds in concentric circles. Always, however, occasional stools survive in ...diseased areas: an attempt has been made to obtain from these, by ...tion, some immune strains of the "Cristalino" cane, which is so sat... ...ory in Cuba from most other points of view. Unfortunately, the ...k was dropped before any results were obtained, but the question is ...that promises to yield most valuable results.

Cuba offers a large field of work for the selection of tropical fruits. At ...ent there is no vine suited to hot climates, though some south Euro... ...varieties are occasionally grown in Cuba with some degree of success. ...There is a native species, *Vitis caribaea* which, even in a wild state, ...ces juicy fine grapes about ⅜ in. in diameter, dark purple in co... ...and might through hybridisation with some of the cultivated grapes ...rise to a race which would be of the greatest value to tropical regions. ...ever, from its productiveness and vigour (this vine sometimes covers ...18 or 20 ft high) it would form an excellent stock for grafting.

In the mountains of Cuba, there is a walnut tree *Juglans insularis*, ...ing nuts which compare favourably in size with the northern black ... The kernels are, however, difficult to remove from the shell and ...titions are thick. Through selection, this tree might be considerably ...ved and might be also of great value as a stock on which to graft ord... ...walnuts (for there are very few nuts that succeed in the tropics). ...Queensland Nut, *Macadamia ternifolia*, which has been introduced at ...Vegas de las Vegas has succeeded very well.

In all parts of Cuba, the mango is one of the most abundant of fruits.

There are two distinct races, *mango* and *manga*. The former is a tree sometimes 60 ft. high; its fruit is beaked at the apex and the rounding the seed is long and coarse. The *manga* is a low spreading or 40 ft. high, with more abundant but finer fibre. Two princip of the *manga* race are distinguished and these are called, from t of the flesh of the fruit, the *manga amarilla* (yellow) and the *ma* (white). There are also other races and types of mangos, the *Filip* very little fibre and of excellent flavour; the *Chino* and *mango* Cienfuegos and the *Biscochuelo* of Santiago de Cuba; the 3 last limited in distribution, but very superior in quality. The most work in mango improvement yet done in Cuba consists in the and propagation of some of these superior types. The mango see duces the type perfectly.

In order to improve the *aguacate* (*Persea gratissima*), budded s selected varieties have been imported to Cuba from Florida. F a few selections have been made, but the work is only just beg The most important point in the selection of varieties is lateness ing; and throughout the island are found occasional seedling tre hold their fruit all the winter.

For the improvement of the *anón* (*Anona squamosa*) the wis vise crossing *Anona Cherimolia* with *A. squamosa* and *A. muricat*

In Cuba, citrous fruits were formerly grown almost exclusively seed. The Government Experiment Station at Santiago de las Vegas the work of searching out and propagating desirable seedlings are found growing half wild in neglected gardens and hedgerows

Many of the most important tropical vegetables grown in Cuba *Arum Batatas*, *D. sativa*, *D. aculeata*, *Colocasia*, and *Manihot utilissi* propagated asexually; the opportunity for selection is not lacking ever, since bud variation is much more common in the tropics than perate regions. Dr. Juan T. Roig has collected over 80 varieties of potatoes from different parts of the island, and is now determining the parative value of each.

During the early years of the Agricultural Station at Santiago Vegas, a great number of varieties of maize from all parts of the U States and Mexico were tested, but none proved to be well ad Cuban conditions. The common variety cultivated in the island was ally of a yellow flint type; the ears are unusually heavily protected husks that completely close at the tip, and the husks, leaves and ate tomentose; this seems to protect the young leaves from the att numerous small insects which are always seen working about them heavy husks protect the ears from the attacks of the corn weevil next planting season. The absence of glabrous varieties is app due to the work of small insects. Some of the dent maize impor Cuba has occasionally been planted and has fertilised plants of the variety, giving rise to acclimatised hybrids. At the Santiago ment Station, they have begun to select the best of these, in the fixing a type with long ears enclosed in heavy husks.

Testing of Agricultural Seeds in South Australia. — ANDREW K. W[illegible] [illegible] *Journal of Agriculture of South Australia*, Vol. XIX, No. 5, pp. 457–458, Adelaide, February 1916.

Under the Federal Quarantine Act, the introduction into the Commonwealth of seeds or plants of over 140 species of noxious weeds is absolutely prohibited. Under the Federal Commerce Act, seeds imported must be pure, clean, and sound, fresh and clean although no standard has so far been set up and discretion is allowed the customs as to what constitutes purity in this respect.

In the case of South Australia, samples of all agricultural seeds imported from abroad are taken at Port Adelaide, the Outer Harbour and the General Post Office Adelaide, by officers of this Department acting as Quarantine officers for plants, and submitted to another officer in this office who examines them to see what weed seeds they contain, and the quality of the consignment is gauged after germination tests have been made. If any doubt exists as to whether they are suitable seeds to admit into the State, the Chief Quarantine officer for Plants for South Australia exercises powers conferred upon him under these Acts, and issues instructions that the goods to be freed (where practicable) of impurities, or to be destroyed, or returned, to the country of origin.

The results of purity tests are not given as in most seed laboratories) as percentage of impurities, but the method adopted is the same as that used in Canada; the number of weeds per unit weight of sample being given.

The germination tests are made in duplicate (two lots of 100 seeds each).

Experiments on the Germination of Seeds of Gramineæ. — KUNG, LEO[illegible] [illegible] *Landwirtschaft*, Vol. 65, No. 1, pp. 25–[illegible], Berlin, February [illegible].

Experiments on 14 species of grasses to determine the optimum conditions for germination.

In order to study the influence of temperature on germination, the seeds were kept in darkness and exposed to constant temperatures (10°, 20° or 30° C.) and also to temperatures varying during the course of germination from 20° to 30° C.

In order to study the influence of light at a constant temperature of 20°, the seeds were placed in a thermostat, one of the sides of which was glass. The experiments all being made in winter, the influence of the direct sunlight was only of secondary importance, but the value of the tests was not diminished thereby.

The seeds were placed either on or between moist blotting paper, or on porous earthenware dishes saturated with water. The water was renewed every two days, to replace that lost by evaporation.

For each species, 4 lots of 100 seeds were taken, except in the case of *Avena sativa* and *Alopecurus pratensis*, where it is difficult to distinguish between good and bad seeds, consequently for these two species a given number of seeds was employed. Altogether some 45[illegible] seeds were [illegible]

The following were shown to be the optimum conditions:

Species	Medium and conditions of germination	Temperature	Date on which maximum number of seeds germinated	
Phleum pratense . .	Between blotting paper in presence of light	Constant, 20°C	4th day	
Dactylis glomerata . .	Between blotting paper	Variable, 20–30°C	5th	21
Avena elatior	do.	do.	1st	
Holcus lanatus	do.	do.	4th	21
Cynosurus cristatus . .	On blotting paper in presence of light	Constant, 20°C	10th	21
Bromus mollis	Between blotting paper in presence of light	do.	5th	21
Agrostis stolonifera . .	On blotting paper in presence of light	do.	4th	
Lolium italicum	Earthenware dishes in presence of light	do.	5th	
Lolium perenne	Between blotting paper or in earthenware dishes.	do.	5th	21
Anthoxanthum odoratum	Between blotting paper	Variable, 20–30°C	7th	21
Alopecurus pratensis . .	a) On blotting paper in presence of light	Constant, 20°C	7th	21
	b) Between blotting paper	Variable, 20–30°C		
Festuca pratensis . . .	a) Earthenware dishes	Constant, 20°C	4th	14
	b) Between blotting paper	Variable, 20–30°C		
Festuca ovina	On blotting paper in presence of light	Constant, 20°C	7th	21
Poa pratensis	Earthenware dishes in presence of light	do.	10th	28

The results are compared with those of other workers, and the following conclusions drawn:

1) Blotting paper is the best medium for the germination of the Gramineæ.

2) Contrary to the opinion of NOBBE, light is absolutely indispensable to the germination of certain species.

3) A change of temperature from 20° to 30° C. (20° for 18 hours, 30° for 6 hours) has proved favourable in many cases.

4) A constant temperature of 20° C., with absence of light is favourable to very few species.

A constant temperature of 30° C. is unfavourable to most species. In the case several species, the germinating faculty should be tested under different sets of conditions.

"Lencino" Rice in Italy. NOVELLI, in *Il Coltivatore*, Year XL, No. 1, pp. 1-2.

The rice had a more important position in Italy before the introduction of Chinese ordinario" but it has still a considerable importance in some regions, Mantua, Venice etc. It does not do well in all soils, requiring deep lands, very little permeable, rich and somewhat clayey. Under favourable conditions it gives excellent returns.

Although now cultivated for a considerable time, it has not degenerated much and retains its primitive character fairly well.

It is vigorous in habit, fairly tall, stools well, and has fine panicles of long grain; high yield. It is very resistant to disease but liable to lodging. Ripens somewhat late but with selection, a subvariety has proved earlier.

It is a "hard" variety, *i. e.* very resistant to hail, or to loss of grains during threshing time. It consequently requires vigorous threshing. It is much appreciated in commerce because it is easily glazed and has a fairly transparent grain. It is a kind deserving notice as it can probably be improved still more by proper selection.

The Milling of Rice and its Effect upon the Grain. See No. 544 of this Review.

The Cultivation of Cotton in Greece. [illegible] *Kgl. Staatsinst. für Obstbau*, VIIIth Year, No. 1, pp. [illegible], Tabl. 1, 1911.

The following is an abstract of an analytical study of different types of cotton indigenous, American, and Egyptian, grown at the Experimental Station of Serres (Macedonia).

Egyptian cottons did not prove satisfactory, turning out far from yielding much waste, and a weak fibre. Its culture is to be left to 15 per cent less than that grown in Egypt, with a loss in ginning 50 to 70 per cent more than average.

The "Chindako" is better, having a greater purity, but is 15 to 20 per cent inferior to the Egyptian Affifoum.

The American varieties "Cleveland Big Boll" and "Russels Big Boll" are all others in cotton and strength of fibre.

Other American varieties named by the writer are of similar value, equal to that of American middling.

The general conclusion is unfavourable to Egyptian cottons, but it is hope that, with suitable cultivation, cottons of commercial value can be acclimatized in Macedonia.

Cotton Hybridisation at the Botanic Gardens, British Guiana. HARRISON, J. B. and BANCROFT, C. K. in *Journal of the Board of Agriculture of British Guiana*, Vol. VIII, No. 1, pp. 144-150. Demerara, September 1914.

Numerous experiments made since 1902 on the cultivation of Sea Island cotton have demonstrated that owing to the unsuitability of the heavy soil and meteorological conditions, this crop is unsuitable for the coastal region

of Guiana. The most favourable season produced a crop of [illegible] of seed cotton per acre. Some promising results were at first [illegible] seed selection of Egyptian cottons, but it was evident, as the r[illegible] various trials, that the different varieties would not yield lint [illegible] quantity to enable them to be grown at a profit. All the va[illegible] except the Buck were found to be very susceptible to the diseases [illegible] among cotton plants, more especially to anthracnose and to cott[illegible]

As the result of these trials, efforts were directed towards [illegible] between the Sea Island and the native Buck cotton, with the obj[illegible] bining the vigour and perennial habit of the latter with the qu[illegible] lint of the former. These crosses have been bred to the 4th gene[illegible] which 24 plants have been finally selected for the development of [illegible]

Ten of these strains and specimens of two hybrids have been s[illegible] to the Imperial Institute for valuation and report. This report s[illegible] the object of the experiments has been attained and it will be [illegible] to learn how the yields and hardness of these long-stapled hybrid[illegible] with those of the indigenous Buck variety.

The brokers' valuation of the lint from the different hybrid[illegible] varied from 11d. to 14d. per lb., with the best Barbados Sea Island at 14[illegible]

104 — **Steps Taken to Preserve *Kokia Rocki*, a Wild Relative of the Cultivated Cotton Plant in Hawaii.** YOUNG, ROBERT A., Office of Foreign Seed and Plant [illegible] Bureau of Plant Industry) in *The Journal of Heredity*, Vol. VII, No. 1, pp. [illegible] Washington, January 1916.

The rise of the science of genetics has given breeders a keen [illegible] of the value of the wild relatives of important cultivated plant[illegible] the former may be of no economic importance. This is the case [illegible] gard to a tree growing wild on Hawaii, and called "kokio" by the [illegible] *Gossypium dryinarioides* by SEEMAN, and *Kokia Rocki* by LEWTON tree was threatened with absolute extinction and was only saved by [illegible] tions of the Office of Foreign Seed and Plant Introduction of the [illegible] States Department of Agriculture. The writer states that about [illegible] cent of the native flora of the Hawaiian Islands is endemic and [illegible] it is of the greatest importance that these species should be pres[illegible] Some "kokio" trees were found at Punwaawaa, in the island of Ha[illegible] a bed of lava at a height of about 2700 ft. The average annual rain[illegible] 20 in. or less.

Gossypium dryinarioides reaches a height of from 12 to 25 ft. [illegible] duces large brick-red flowers, each of which gives rise to a seed boll [illegible] ing several seeds covered with short reddish hair. The natives [illegible] the cotton, but strip the trees of their bark which they use for dyeing nets; the colour of the sap is reddish and is waterproof.

105 — **A Promising Coconut Clearing in Malaya.** — BROWN, L. C. (Late Inspector of Coconuts, F. M. S.) in *The Agricultural Bulletin of the Federated Malay States*, Vol. [illegible] No. 12, pp. 445-449. Kuala Lumpur, September 1915.

The following is a brief history of some seed coconuts planted [illegible] estate in Malaya in 1912.

60,000 nuts were purchased at a price of £7-12 s.; half of these

... nursery in May and the other half in June. The number germin... was 53,000 or 88 per cent. The seedlings were planted out from Novem... 12 to January 31, 1913, on 1104 acres of a free clay loam containing ... At the time of planting, the shoots were from 8 to 18 inches long ... the end of the first year averaged about 12 feet. The first wood at ... was formed at the age of 1 year 10 months and the first flowering ... buds appeared at 2 years and 5 months. The growth of the trees ... even and the average height at this stage was 20 feet and average ... inches. The height of the wood at the base was 18 inches and ... est number of rings (leaf scars) was 12. At the age of 3 years, the ... the largest nuts was 4 inches long.

Thus, these coconut palms came into flower in the record time of 2 ½ ... from the time of planting the seedlings and bore nuts at the age ... five years.

The writer attributes this remarkable growth to the care taken during ... al period in the life of the palms viz., from germination to the 3rd ... and particularly at the time of planting out.

Production of Manna by Olive Trees in Algeria. BALTHASER J. V., in *Journal d'Agriculture Tropicale*, No. 4, p. 105. Paris, February 15, 1914.

In 1901 an abundant production of manna by olive trees was recorded the present writer. This rare phenomenon was again observed, to ... the end of 1913, by M. DE PEYERIMHOFF, Inspector of Forests Director of the Forestry Station of Algiers. In this latter case it ap... from the trunks of olive trees attacked by the larvae of *Cossus* which ... out a number of galleries in the wood. The manna was partic... abundant and huge stalactites hung from the whole length of the ...

M. DE PEYERIMHOFF thinks the rarity of the occurrence is due to the ... that *Cossus* only very seldom attacks olives.

Experiments have been begun in order to attempt to induce this phe... non at will, which, if successful will be of considerable practical im... ance.

On the Coagulation of *Hevea* Latex and a New Method of Coagulation. EATON ..., and GRANTHAM J., in *The Agricultural Bulletin of the Federated Malay States*, Vol. IV, ... 2, pp. 29-30. Kuala Lumpur, November 1914.

When latex is allowed to coagulate spontaneously in open vessels, a pe... liar slime or yellow scum forms on the surface. This surface scum is ... line in action while the serum below is acid, thus showing two distinct ... sses of decomposition *viz.*: an alkaline aerobic process and an acid anae... process. This latter is the basis of a patent anaerobic process of ... lation in which the latex is allowed to coagulate in tall cylinders so ... reduce the amount of aerobic decomposition.

Latex sterilised in an autoclave at 140°-150° C. remained uncoagulated ... several days under sterile conditions, but on exposure to air or after ... ulation with a little fresh latex, coagulation set in after 24 hours, ... wing that coagulation is dependent upon bacterial decomposition.

Latex heated to 97°-100°C. and kept under sterile conditions spontaneously without putrefactive change, the serum becomes acid. Putrefaction, however, sets in later.

The writers conclude from these results that coagulation is due not to an enzyme but to bacterial action of a non-putrefactive nature.

There are therefore two kinds of bacteria capable of developing in latex according to the conditions, the putrefactive organisms being inhibited by a lower temperature than the non-putrefactive organisms.

Experiments were then made to increase the activity of the latex putrefactive organisms by the addition of sugars and it was found that the addition of 0.2 per cent of dextrose brought about coagulation in 18 hours, the whole of the dextrose being completely decomposed. The addition of dextrose to sterile latex did not bring about coagulation.

Coagulation under anaerobic conditions is not uniform, since it depends on the constituents of the latex. This method, therefore, does not yield rubber of uniform quality.

197 **Experiments on Sugar Beet Growing in the South West of France.**

H. BLIN and J. BRICARD, in *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, No. 3, pp. 1-31. Paris, January 1916.

In France, the cultivation of sugar-beet has been restricted almost entirely to the northern provinces. As this state of affairs is not without drawbacks and even danger, the writer has attempted the growing of the crop in other regions, particularly the South West. In 1914, experiments were carried out in the following departments: Lot-et-Garonne, Gers, Dordogne, where tobacco is grown. Comparing the nature of the soils suited to the two crops, it was considered that where tobacco was grown the beet should also succeed: both require deep, moist, but not wet soils and both are suited by clayey loams or by clayey chalk soils with a good supply of humus.

Owing to the scarcity of labour, the only experimental fields to receive sufficient preparation were those situated in one of the fertile tracts of the Causses du Quercy, in 1914, and those on the alluvial lands of the Lot valley, in 1915. The results in these two cases are given in the pendent table and show that at any rate the sugar varieties of beet tested are capable of being grown with profit in South West France.

1) The average yield per acre in the Lot valley is slightly less than that for the north of France (according to MALPEAUX, 13.08 tons per acre).

2) The average yield of sugar is at least equal to that obtained in the North of France.

3) The lands of the fertile regions of the Causse (a calcareous plateau between the Lot, the Tarn and its tributaries) are equal in fertility to the alluvial lands of the Lot valley, as far as the sugar varieties are concerned.

On the other hand, distillery beets did less well in the Causse than in the alluvial soils where they showed a sugar content equal to that produced in the North.

4) Climatic conditions being the same for the 4 departments tested

Varieties tested	Results in 1914		Results in 1915	
	Cwt. per acre	Sugar content	Cwt. per acre	Sugar content
Sugar				
[illegible]	298.8	15.0	318.6	17.0
[illegible] Wanzleben	278.8	17.1	320.2	17.4
Distillery				
[illegible] with green neck	286.8	7.5	312.9	14.2
pink	293.9	6.8	300.7	12.8
grey	286.8	9.5	312.0	11.5

[illegible]ned above, it may be assumed without further trial that the lands similar to those of the Lot valley are well suited to this crop. Such are: those extending, in Dordogne, from Eyzies to Sarlat and from Sarlat to St. Foy-la-Grande; those of Lot and Garonne which lie between Fumel and Tonneins passing by way of Villeneuve-sur-Lot and St. Livrade.

Varieties of Strawberry Tested at the New York Experiment Station. TAYLOR [illegible] M., in *New York Agricultural Experiment Station, Geneva, Bulletin* No. 391, pp. 105–167. Geneva, N. Y. March 1915.

A description of 105 varieties of strawberry tested and examined during the last 3 years at the New York Agricultural Experiment Station. The kinds grown include newer varieties, with standard commercial kinds for purposes of comparison. As climatic and soil conditions have a great effect upon the crop, those obtaining at the Station are given, in order that a better opinion can be formed of the results of the tests of the different varieties.

Attention is drawn to the importance of the various properties of the strawberry plant, such as the seasons of blooming and ripening, the sex of the flowers, stolon production, productiveness, vigour of plant, resistance to disease and the size and quality of the fruit. The varieties are classified as follows: early or late bloomers; varieties maturing early or late; those that are prolific or scanty plant producers; very unproductive or very productive varieties; those growing rapidly or slowly; varieties susceptible to leaf spot (*Sphaerella fragariae*); kinds producing very large or very small fruit; varieties rating high in quality.

A list is then given of the 30 varieties that gave the best results in the cultivation tests at the Station, and finally a detailed description of the 105 kinds studied, with an account of their behaviour under the soil and climatic conditions obtaining at the Station.

The place of origin of the variety is given in each case.

ROPS 409 - **The Cultivation and Manuring of *Oxycoccus* (*Vaccinium*, ... *carpus*.** - FRANKLIN H. J. in *Massachusetts Agricultural Experiment Sta...* No. 160, Report of Cranberry Substation for 1914, pp. 91-117. Amherst, Mar...

Frost Protection. In order to see whether cloth could be used satisfactorily to protect bogs from frost, a strip of new cloth was supported by wires held 3 ft. above the ground by stakes, about 9 square rods of ... dry grassy low land being covered in this way, the cloth being ... down to the ground to shut in the covered area on all sides. It was ... that the cloth greatly retarded the loss of heat from the ground. A ... meter placed in the centre of the covered area, with its bulb 5 in. ... the ground was more than 4 ½° F. higher (2.2° C.) than a similar ther... meter at the same elevation placed about 20 ft. outside the cloth. No ... formed on the covered ground, even when the surrounding ground w... white with frost.

The writer estimates that the first cost of this means of protection fully installed would be less than £ 200 per acre, but the cloth ought to give good service for many years. He is of opinion that the use of cloth protection is to be recommended for bogs that are winter flowed but for strictly dry bogs (without winter flowage) the expense is prohibitive because the returns from such bogs are comparatively small.

Fertilising experiments. These were carried out with either one compound, or a mixture of 2 or 3 compounds; to one plot which was treated with a nitrogen-phosphatic-potassic fertiliser, lime was also applied. The amount of fruit picked was taken into account, as well as the losses in the stored fruit. The yield varied from 6 1/3 bushels to 10 4/5 bushels per acre; both these amounts being obtained from a control (unfertilised) plot. The fertilisers consisting of 3 compounds increased the yield more than those consisting of 2; sulphate of potash was more efficacious than chloride of potash; liming had not much effect. Of the different compounds used nitrogen increased the yield to the largest extent.

During storage, the losses varied from 22.22 per cent (check) and 37 ... per cent (complete fertiliser and liming). The nitrogenous fertiliser decreased the keeping property of the berries somewhat, as it made them more juicy. The fertiliser had no appreciable effect upon the size of the berries. The application of nitrogenous fertilisers during the beginning of the bloom seemed to stimulate and increase the setting of the blossoms and the fruit formation.

Maximum temperature at which flooding water can be used without damage to buds. — Some cranberry growers were afraid that if the temperature of the water of the June reflowage were too high, serious damage might be done to the buds of *Vaccinium*; the writer, however, found that an exceptionally high temperature: 86° F. (30° C.) did practically no harm to the buds.

Experiments in Italy on the Best Time for Pruning the Vine. — DALMASSO G. in [illegible], Year XXII, No. 3, pp. 44-47. Conegliano, February 1, 1915.

The question as to whether it is best to prune the vine early or late [illegible] yet be said to have received a satisfactory answer and it seems indispensably necessary to extend the observations made under different climatic, soil and cultural conditions.

[illegible] of Pruning	No. of vines per row	No. of the row	Average yield per vine	Composition of must		Index of ripening
				Sugar	Acidity	
			lb.	%	‰	
[illegible] 15	106	IV	2.51	21.00	6.05	3.15
	105	XI	2.58	20.50	6.18	3.28
	Average of 2 rows		2.54	20.95	6.11	3.22
[illegible] 15	105	V	2.82	18.80	6.84	2.74
	107	XII	2.03	22.00	6.00	3.66
	Average of 2 rows		2.43	20.40	6.42	3.17
[illegible] 15	106	VI	2.89	21.15	6.93	3.05
	107	XIII	2.31	22.40	6.18	3.60
	Average of 2 rows		2.60	21.72	6.53	3.34
[illegible] 15	106	VII	2.14	20.90	6.79	3.11
	106	XIV	1.21	20.70	6.56	3.11
	Average of 2 rows		1.68	21.80	6.65	3.27
[illegible] 15	101	VIII	2.38	21.35	6.18	3.45
	107	XV	1.50	21.45	6.37	3.30
	Average of 2 rows		1.94	21.40	6.27	3.41
[illegible] 15	107	IX	2.61	21.15	6.18	3.42
	104	XVI	1.17	21.70	6.75	3.21
	Average of 2 rows		1.59	21.42	6.46	3.31
[illegible] 15	62	X	1.19	20.75	6.00	3.46

New investigations have been begun in the vineyards of the "Scuola Enologica" at Conegliano, on the 2 following varieties: a vine of the Italian Riesling variety growing on level ground and pruned according to the Guyot method, and a vine of the Rhenish Riesling variety planted on a slope. Although the data of a single year are only of a very relative value, still the results observed in the two cases were so markedly opposed that they deserve immediate notice. They are given in the appended Table.

As regards *quantity*, late prunings (in spring) do not seem to have yielded such satisfactory results as autumn and winter pruning. The effect upon the *quality* of the product is less obvious. The continuation of the experiments will prove whether or not the observations of the first year represent a normal occurrence.

411 - **Observations on the Cultivation of Direct Bearers in Savoy (France) in 1915**

CARTIER F., in *Le Progrès agricole et viticole*, Year 36, No. 46, pp. 473-475, Montpellier (Rhone), November 14, 1915.

Observations made by the writer on 2 vineyards situated near Aix les Bains, on slopes of fairly calcareous nature but with clayey spots, with due southern aspect was very warm, dry and early, there being in some places only from 20 to 30 cm. of soil above the rock. These vineyards have never been fertilised. The year 1915 being a very bad one for vines many growers in this district only obtained grapes from direct bearers, but others also got fairly good crops from certain *vinifera*. Of these, the most attacked were the "douce-noire", or "corbeau", and the "crépy" or "pendant roux". The writer obtained, in 1915, from his direct bearers a better crop than in 1914 with a slight treatment towards July 10 (oil spots of mildew) the first applied for 8 years.

The following numbers are considered the best for 1915.

Old Hybrid Direct Bearers. — 580 Jurie does very well in the plain but on hot and dry slopes it sometimes loses its leaves (1911 and 1915). It is the only direct bearer that has a high degree of acidity, even when perfectly ripe, which corrects the insipidity of the must of the greater number of the other hybrid direct bearers.

Of the *Seibel Old Hybrids*, 2044 has always proved very productive; 405 is very resistant to drought in the worst soils, even those that are calcareous; its fine bunches escaped the attacks of Cochylis; 2007 remains quite healthy without treatment; being exceedingly productive, it is necessary to prune it rather close; 1007 is very productive and very healthy; 209 bears largely with 1 or 2 treatments. Of the *Old Couderc Hybrids* 4401 has proved very productive, vigorous and healthy, its bunches and grapes are better that those borne by 4401; 122-20, 106-51 and 7103 are also distinguished for their good grapes.

White Gaillard 157 has always proved a good producer; it is not very vigorous and consequently needs grafting on poor soils; after 3 years it becomes chlorotic in the spring on calcareous soil.

New Hybrid Direct Bearers. — *Seibel Hybrids*: 2779, first and second period of ripening; very productive, vigorous, juice white; 2582, very

...ve less vigorous, bunches very long ; juice coloured ; 4591, extremely ...gs habit of 405 but more productive ; 4490, large produce1, vigo... These 4 kinds require 1 or 2 treatments. — 4009 very vigorous, ...ge fruit, very productive ; 4643, 4683, 4020, 4030, varieties with very ...nches, and grapes above the average ; 4433 and 4438, large bunches ; ...very vigorous, one of the hardiest varieties, very long bunches ; 2734 ...vigorous, habit and foliage same as Othello, excellent grapes with ...berry flavour. These 9 kinds are very resistant to mildew and can ...ase with treatment in ordinary years. The following numbers re... at least 2 sprayings and are only of average vigour ; they are ...productive and have very fine compact bunches with large grapes : ... 4217, 4111, 3011, 3013 and 4005 (very early) ; the 2 last produce ...e grapes. On poor soils, these numbers require grafting, especially ...and 4217.

Among the *Seibels with white grapes*, the following are recommended : very resistant to mildew and very productive, sweet grape, requires ...d soil ; 2709 and 4132 have fine bunches with large grapes ; 4744 and ...require two sprayings with copper sulphate. The following numbers are ...vigorous : 4055 very productive ; 4505, 4747, 1707, 4773, 4708, and ...ially 4076 and 4762, all very productive, belonging to the first and se... period of ripening, 2859 (rose) ; 4090 ; 4064 all these numbers only ...re one application of copper sulphate ; 2055, with very fine bunches, ...setting, 4151 and 3013, all very productive of grapes for the vat and ...ble, but less vigorous than the preceding. They require, at least, 2 ...yings and on poor soils need grafting.

Amongst the *Seibels with black grapes*, Nos. 2858, 5059, 4100, 4739 ...4740 have proved vigorous and very resistant. *Malègue rouge* 800-2 ...850-3 proved very vigorous, they require one spraying.

Clemivesse, or *Chazalon*, is delicate and susceptible to mildew, and ...2 treatments.

Bertille Seyve Hybrids. — 313, a very good grape, first period, a little ...ptible to Oidium ; 822 vigorous, very good crop ; 453, fine bunches ...close fruit ; 893, first period, excellent grape, very productive ; 450 ...e, a Noah without foxy flavour but much more productive, with large ...bunches. All these Bertille-Seyve numbers of the first and second pe... are very resistant to mildew and can possibly do without spraying.

Couderc Hybrids. — 272-60 is very vigorous and very productive in ...fresh soils, unsatisfactory on the dry soils of the slopes, susceptible to ...um. 239-35 or Muscat du Moulin is vigorous and very resistant ; it pro... an excellent table grape.

Baco Hybrids. — Vines 1, 22A, Capéran, Petit Bouschet and Chasselas ...all very resistant to mildew ; the first is extremely vigorous.

In general, all the hybrids here mentioned grow best and are most ...rous in the plain, especially on damp soil ; many are susceptible to ...ching and the heat of the sun during drought ; some ripen better in ...p than in dry years ; such as for example 126-25 Couderc, which ri... better in the shade than in the sun ; 2044, 580 etc.

The grapes of direct bearers are generally fermented in the mixed with *vinifera* grapes, as they decrease the acidity and impr colour of these latter; the wines obtained sell well for immediate c tion. On the other hand, even the original direct European-A bearers (Othello, Noah), are acclimatised in Savoy, and have now a great extent their former foxy taste.

412 **Vine-Growing in California.** — SWETT, F. T., in *The Monthly Bulletin* ... *tion of Horticulture*, Vol. IV, No. 11, pp. 501-513. Sacramento, Cal., Nov. ...

At the present time, in California, the future of the grape i like that of the apple and peach industries, is decidedly uns will need the wisdom of legislators, the skill of technicians, and the of business men to carry it through the coming decade without severe losses, the effects of which would fall heavily on growers o on banks, on business men and on wage earners.

The growth of the grape and wine industry in California h steady, continuous and rapid, as is shown by the increase in the av quinquennial returns of wine production from 1869 to 1914. The amount of wine produced in each five-year period, in round numbe lons, is 16 million, 21 million, 42 million, 71 million, 89 million, 9 142 million, 187 million, 225 million.

There are now 170 000 acres of wine grapes. In addition part of the product of table grape vineyards and of raisin grape vine goes to the wineries. This steady growth, which is due to high pri tained by the growers, is in contrast to the violent fluctuations of t chard business. The latter, with few exceptions, fell off greatly be 1900 and 1910, as is shown by the following statistics taken from t port of the State Board of Agriculture.

Comparative Table of Fruit Trees in California in 1900 and 19

	1900	1910	In
Apples	2 878 169	2 482 762	
Apricots	4 244 384	2 902 453	1
Pears	2 512 896	1 410 605	1
Cherries	686 891	522 304	
Olives	1 530 104	836 347	
Lemons	1 493 113	941 293	
Pomelos	80 918	43 127	
Almonds	1 691 947	1 166 130	
Plums and prunes	9 832 713	7 168 705	2
Totals	24 852 180	17 564 326	

paring the ten-year period, 1900-1910, the acreage of the above 6 varieties of fruits dropped from 248 000 to 175 000, a shrinkage of nearly 30 acres.

In the meantime, the vineyard acreage during the same time has grown to a total of about 330 000, composed of about 170 000 of wine grapes, 110 000 raisin grapes and 50 000 acres table grapes. Nevertheless, owing to the heavy internal revenue tax levied recently by Congress on brandies and on the brandies used in the fortifying of sweet wines, the wineries of the interior valleys have already cancelled contracts for at least 200 000 tons of grapes. The tonnage of table grapes that can be used this season by the wineries is, however, doubtful.

With a full crop of table-grapes, about 20 000 carloads are shipped, while during the last 3 years, an average of only about 6 500 a year were exported, with perhaps 1000 cars a year used in local markets. The rest have to be sold at a loss to the wineries. It is beyond dispute that table grapes have been over planted, an excessive and ruinous oversupply of mid-season grapes having been grown; there is, however, room for more early grapes of good quality and for more late grapes of good keeping quality.

The State Board of Viticultural Commissioners made an exhaustive study of the financial losses incurred by shipping unripe grapes and proposes a law which came into force in 1915, the "Ashley Standardization Law" which provides that grapes must contain a minimum of 17 per cent of sugar for all grapes except the "Emperor".

The Commission is also devoting its attention to the questions of replacing mid-season grapes by early and late kinds, and of grafting the "Zante", "Almeria" and "Emperor" varieties.

The writer states that there is a tendency among such owners of vineyards as have sufficient capital or credit, to replace every third vine with prune, pear, almond, or some other fruit tree. He is of opinion that, in view of the great importance of the agricultural undertakings in California, it is increasingly necessary to study the economic problems, which at present seem to overshadow the technical ones, and in conclusion, agriculturists are reminded that agriculture, the one large industry that from present appearances can never be overdone in California is to be based largely upon general farming and animal industry.

LIVE STOCK AND BREEDING.

41. **Studies on the Heredity of Rabies.** — KONRAD DANIEL in *Annales de l'Institut Pasteur*, Vol. XXX, No. 1, pp. 33-48. Paris, January 1916.

Work carried out at the Institute of Pathology and General Therapeutics at Kologsvár, Hungary. The writer had previously shown that the infectious matter of rabies is transmitted from the mother to the embryo. Subsequently to the publication of these articles, other experiments were made on the same subject with contradictory results. The writer crit-

icises these experiments and gives an account of his later researches, from which he draws the following conclusions:

1) The infectious matter of rabies is transmitted from mother to foetus, but is attenuated in the process. This explains why rabies manifests itself by degrees, following, as it does, the gradual removal of virus from its source.

2) As regards this transmission, there seems to be no difference between different species of animals; it occurs equally in dogs, rabbits, guinea-pigs, and probably in the case of the other animals also.

3) In order to obtain good results from inoculation, guinea-pigs, and not rabbits, must be used, and the injection should be made beneath the meninges. Guinea-pigs being more susceptible to rabies, give more rapid and certain reactions. As rabbits only contract rabies very late and are sometimes immune, their use may lead to erroneous conclusions being drawn.

4) In the case of guinea-pigs it is also very important to prolong the time of observation, since these animals also contract the disease much later than those that are inoculated with virus from the mother.

5) The virus is already circulating in the blood of the animal infected when fever, the first symptom of induced rabies, makes its appearance. By means of the blood it is transmitted from the mother to the foetus some weeks and even months before death.

6) The bite of a dog is already dangerous 14 days before the appearance of the characteristic clinical symptoms.

114 **Treatment of Foot-and-Mouth Disease by means of Hellebore.** — SANFELICI L.: in *Il Moderno Zooiatro*, Series V, Year V, No. 1, pp. 17-20, Bologna, January [illegible].

The root of hellebore is an old empirical remedy which has been completely abandoned by ordinary medical and veterinary practice. The writer, on the other hand, in the course of a long career, has never completely abandoned its use and has lately obtained excellent results in the treatment of the malignant form of foot-and-mouth disease.

Whereas the symptoms of the benign form of this disease are the appearance of large vesicles on the mouth and feet accompanied by a variable amount of fever which ceases directly suppuration sets in, those of the malignant form are minute vesicles on the gums and insignificant lesions of the feet accompanied by very high fever. The cause of the second form is apparently some infective agent still unknown which, gaining access to the organism, acts directly on the blood by attacking the plasma, thus influencing the most important nerve centres.

For the benign form, any treatment based on antiseptic dressing is effective.

In the treatment of the malignant form, the writer has made use of fixation abscesses, that is to say of revulsives provoking the formation of foci of induced inflammation in parts of the body removed from the infective centres; these foci attract the germs and toxins infecting the blood and thus cause the resumption of phagocytosis by the leucocytes. Injections were begun with turpentine, but this treatment is impracticable in

... the strong dose required would be sufficient to impart an odour ... flesh and render it useless should it be necessary to slaughter these ... suddenly. Recourse was then had to the root of hellebore, the following method being adopted :

Some 10 to 15 roots of hellebore are taken, according to the age ... of the animal, and allowed to macerate in vinegar for 15 minutes. After preliminary disinfection, a longitudinal incision is made ... fetlock, the scalpel penetrating the cellular tissue ; the root is then ... firmly in the wound and allowed to remain for 48 hours. At the ... that time it is withdrawn, the flesh slightly scarified, and the wound ... cterized, disinfected and bandaged. The result of the treatment is to cause ... ling of an inflammatory nature extending as far as the neighbourhood ... the sternum, with secretion of purulent serum.

Should no swelling of the fetlock be observed at the end of 24 to 30 ... the case will have a fatal termination ; if the reverse be the case, ... is certain.

In the course of an outbreak there occurred among 4000 head of cattle, ... cases of epizootic foot-and-mouth disease, of which 81 were of ... malignant type. Of this latter number, 17 succumbed to the apoplectic ... 13 were treated with the usual antiseptics and 51 with roots of hellebore. Except in 2 cases where the disease was too far advanced to give ... cal reaction, all the remaining 40 animals were cured.

Single Food Diet and Nutritional Deficiency. WILBERT and MOURIQUAND (... ... *Comptes Rendus des Séances de la Société de Biologie*, Vol. LXXIX, No. 1, pp. ... Paris, ... May 27, 1916.

It is generally admitted that a diet consisting exclusively of one food ... a limited number of foods is the cause of nutritional troubles which ... culminate in a very serious organic breakdown and even in death ... occurrence of scurvy, beri-beri and certain infantile diseases are explained in this manner.

On the other hand, milk and potatoes (the latter sometimes the sole ... of certain portions of the population in Ireland) are two examples of ... sive diets which do not necessarily occasion nutritional troubles.

A series of experiments has shown that :

1) Pigeons fed exclusively on whole cereal grains (rice, barley, ... maize) follow their normal development.

2) Feeding with the same grains completely devoid of husk causes ... ficiency " troubles (polyneuritic and cerebellar type) followed by death.

3) An exclusive diet of barley only partially husked ($\frac{1}{4}$ or $\frac{1}{2}$ of ... still remaining) is sufficient to maintain the birds in health.

4) Complete sterilisation of barley grains causes " deficiency " troubles absolutely identical with those occasioned by their decortication.

5) Feeding of cats on an exclusive diet of fresh raw or frozen meat ... this life for a long period, whereas the same meat sterilised (at 120° C.) ... (in 25-35 days) nervous derangement followed by death.

The above facts show that a single food diet becomes harmful only ... sterilisation or, in the case of cereal grains, decortication.

A varied diet is undoubtedly more suitable to the organism consisting of a single food. Feeding pigeons with a mixture of grains has also been shown by experiment to be more favourable than feeding with a single species of decorticated grain. But it be given a mixed ration (wheat, barley, rice) of decorticated cere there occur, after 14-24 days, symptoms of paralysis followed just as in the case of the ration consiting of decorticated grains species of cereal. So that not only has the variety in the diet been to effect normal nutrition but it even seems (judging from the with which troubles appear) to have hastened "deficiency"

In conclusion, the writers have compared the influence on the tion of the rabbit, of a given vegetable ration in the raw and sterilised states. In the case of the raw ration the health of the was not impaired after 100 days of experiment. In the case of sterilised ration (1 ½ hours at 120° C.) troubles of a scorbutic ty peared towards the 35th day and resulted in death. Again the nature of the diet was incapable of protecting the animals from ciency" troubles.

The decortication and sterilisation of cereals and the sterilis meat and vegetable removes from these foods "vital" substances ments" (vitamines of FUNK) the presence of which in infinitesimal ties assures the assimilation and utilisation of the ordinary nutritive stances (proteids, carbohydrates, fats).

It is the suppression of these substances by sterilisation or co cation and not the exclusive nature of the diet which, in the prece periments, seems to be the primary factor in inducing deficiency t and death.

110. **Formation of Albumen in the Animal Body at the Expense of Nitrogenous Albuminoid Substances.** — SPITZER, in *Fühling's Landwirtschaftliche Zeitung*, No. 11-12, pp. 251-265. Stuttgart, 1913.

The syntheses of albumen only occurs in a small degree in the of domestic animals, as with normal feeding they draw chiefly upon albumen of the forage.

However, ABDERHALDEN's experiments have shown that the tion of albumen by synthesis may occur in animals when the neces constituents are present. The components of albumen may be divided 2 groups: amino acids of the fat series and amino compounds of the atic series. The chief members of the second group are trytophane tyrosine.

The formation of amino-acids sometimes takes place in the live animals at the expense of carbohydrates (glycogen) and ammonia substance intermediate between the carbohydrate and ammonia on one hand and the amino-acid on the other is a cetonic acid. Conseque there is only formation of amino-acids belonging to the fat series synthesis of albumen is impossible if there are not present in the amino compounds of the aromatic series.

The writer makes the following statements based on his own and on ...rious experiments:

1) Carnivora and omnivora are capable of forming albumen synthetically when, in addition to amino-acids of the fat series, there are also present in the body tryptophane and tyrosine.

2) Carnivorous animals are capable of drawing upon a certain quantity of amino compounds and of urea for certain physiological needs. If the food is poor in albumen there is at most a state of nitrogen equilibrium ... the body as these nitrogenous compounds protect the albumen of the ...dy against decomposition.

3) Herbivorous non-ruminant animals behave similarly to carni... and omnivores.

4) Ruminants behave differently on account of the large number ... bacteria living in their stomachs and intestines, except in the case of ...ng animals in which the paunch is not yet sufficiently developed.

5) Ruminants which yield no milk may make use not only of certain ...mo compounds (asparagin), but also of ammoniacal salts (ammonium ...etate) by transforming them by the aid of bacteria into a species of al... known as "bacterial" albumen (Bakterieneiweiss) which is partly util... by the animals. However, this process takes place only when the for... is rich in carbohydrates and contains a certain quantity of albumen ... too small). The productive value of this albumen is also much smal... than that of the albumen of the fodder. The asparagin or ammonium ...etate which is added to fodder increases the digestibility of the crude cel... and the nitrogen free extract. Experiments of a similar kind ...th urea have not yet been made in the case of the above class of ...imals.

6) On administering fodder sufficiently rich in albumen to rumi...nts yielding milk, and on adding asparagin to the fodder, effects of two ...fferent kinds may be observed:

a) the asparagin does not react;

b) the asparagin stimulates the udder in such a way that the milk ...ield is greatly increased at the expense of the meat. When a portion of ...e albumen of the fodder is replaced by amides or by ammonium acetate, ...e milk yield is always decreased, because the quantity of albumen formed ...y the bacteria at the expense of these substances is not sufficient to make ...p for the deficit in the albumen of the fodder. From the scientific point ... view, it is interesting to note that ruminants may, in certain cases, make ...e of the albumen formed by the bacteria for milk production and body ...aintenance, but from the practical point of view the interest is limited ...wing to the fact that the economic value is *nil*.

Similar experiments with urea have not yet been made in the case ... ruminants giving milk but it may be assumed that this substance be...ves in similar manner to ammoniacal salts.

417 **Experiments with Ammoniacal Salts in the Feeding of Ruminants.** MORGAN A., In *Deutsche Landwirtschaftliche Presse*, Year 43, No. 16, p. [illegible], February 23, 1916.

An account of feeding experiments with ammonia salts (chiefly the acetate) on ewes and goats extending over a period of four years. The animals were first fed a ration containing, on an average, 2.3 to 2.5 kg. of digestible albumen per 1000 kg. of live weight. In 24 cases, part of the albumen was afterwards replaced by acetate of ammonia, and in 12 cases by carbohydrates in the following proportions: 36 per cent of albumen the first year; 44 per cent the second year; 62 per cent the third and 70 per cent the fourth.

The results of these experiments expressed as percentages of those obtained with the ration containing the full proportion of albumen are given in the table below.

The results of the experiments may be summarised as follows:

1) Substitution of acetate of ammonia for part of the albumen caused a decrease in the quantity and richness of the milk. The smaller the albumen content of the fodder, the poorer the milk.

2) The substitution by carbohydrates of the same amount of albumen still further reduced the quantity and richness of the milk.

3) Acetate of ammonia had less effect upon the milk yield, the less the albumen content of the forage.

Acetate of ammonia can thus only partially replace albumen. In the digestive tract (especially the paunch) it is transformed by bacteria into albumen which is utilised by the animals. It is considered that acetate of ammonia is capable of replacing part of the albumen, not only in a maintenance ration, but also for production. It must, however, not be given in too large quantities, for fear of ruining the health of the animals. It is better only to use acetate of ammonia in cases where albumen is entirely absent.

Results of Experiments (*Values stated as percentages*).

	Acetate of ammonia				Carbohydrates			
	No. of animals	Milk produced	Dry Matter of Milk	Fat	No. of animals	Milk Produced	Dry Matter of Milk	Fat
1st year	1	93.7	98.9	—	7	78.0	75.4	[illegible]
2nd »	9	92.7	91.1	92.5	6	94.1	88.8	[illegible]
3rd »	9	69.6	67.8	67.2	—	—	—	—
4th »	5	75.1	72.6	72.0	2	63.7	62.4	[illegible]

418 - **The Heredity of Sex** (1). — *The Journal of Heredity*, Vol. VII, No. 1, pp. 41-44, Washington, D. C., January 1916.

Under ordinary conditions, for every 100 female calves born in a herd of cattle there will be 107 male calves. Many cases have, however, been noticed in which the proportion was very different.

(1) See also *ibid.*, March 1916, No. 320.

Thus, in a herd of registered dairy cattle, about 75 per cent of all the calves born in recent years have been males, while in another case a cow (which has beaten the world's record for milk production) and its two sisters dropped 12 male calves and only 1 female. The study of the ancestry of these animals revealed, both in the first and second case, an hereditary tendency to produce more offspring of one sex than of the other. The possibility of obtaining by selection a breed of fowls that has a tendency to produce disproportionate numbers of one sex has also been proved. Mr. H. E. SHARP, a breeder of the State of Washington, has developed a strain of Langshan fowls that are producing over 90 per cent females, and this trait is being transmitted from generation to generation; he has also found that amongst the chickens hatched from the eggs of a single fowl, the proportion between the males and females varies very little with the change of the cock with which the hen is mated, or from one year to another, whereas it varies enormously in the case of different fowls of the same lot.

The inbreeding experiment of Dr. HELEN DEAN KING at the Wistar Institute, Philadelphia, has given results which lend some colour to the belief that a strain of animals may be produced having a tendency to produce disproportionate numbers of one sex. The experiment has been carried out for 6 years, and during this time more than 22 000 albino rats have been bred and studied. From the same litter 2 males and 2 females are taken; inbreeding was practised to the 6th generation without any artificial selection; 2 pairs were taken from this generation, the one (brother and sister) from a litter containing an excess of males, the other from a litter containing an excess of females. There has been steady selection in the opposite direction through 21 generations with strict inbreeding of the animals selected. The result is that, instead of a normal ratio of 107 males to 100 females (which was established at the beginning of the experiment) Dr. King now gets in the one line 150 males to 100 females, and in the other, 65 males to 100 females.

- **A New Type of Cattle for Alaska.** – *The Journal of Heredity*, Vol. VII, N. 1, pp. 18, 1 fig. Washington, January 1916.

No breeds of dairy or beef cattle have as yet been found hardy enough to stand the winters in the interior of Alaska without excessive expense for food and protection against cold. As a result, milk sells for 50 cents a quart and the beef that is consumed in the country consists almost wholly of cold-storage meat brought from the outside. To remedy this situation as far as possible, the Alaska Experiment Station have undertaken to cross Galloway cattle with the Yak, an Asiatic ox much used by Mongolians, Tibetans etc., for milk and meat as well as work. It is used for a beast of burden at altitudes of 12 000 ft. and more. It is extremely hardy, pastures through the winter under the open sky in Siberia and obtains feed from last year's dead grass dug from under the snow. Crosses of the Yak and ordinary domestic cattle are common in parts of Asia (for example in Turkestan) and have been found of much value.

429 - **Experiments in Germany on the Causes of Sterility in Male Goats.** — [illegible] in *Deutsche Landwirtschaftliche Wochenschrift* Year 23, No. 52, pp. 451-457, with figures. December 25, 1915.

A detailed study of sterility in male goats. According [illegible] writer, sterility in goats is chiefly due to the male, whereas with [illegible] the contrary is the case. Sterility in the male goat may be either [illegible] and *temporary* or *total* and *permanent*.

I. Partial and temporary sterility is found in the following cases:

1) When the male goat is weakened by disease.

2) When it is badly fed.

3) When a male goat serves too large a number of females [illegible] generally not sufficient spermatozoa to fertilise them all. This, however, in the writer's opinion, is quite an individual character, since there are examples of quite exceptional sexual potency; thus a good Flemish goat served 17 females in a single day and 350 in one season, most of which need not be put to the male a second time.

4) Onanism is also a cause of sterility.

All the foregoing cases of sterility are curable.

II. — Total and permanent sterility can be induced by various causes of which the following are the principal.

1) *Cryptorchism and hermaphroditism.* — These defects are more observed in the male goat than in the stallion or bull, but the consequences are less serious in the first-named animal. These cases of sterility are [illegible] missible by the parents.

2) *Sterility due to closure of the seminiferous ducts.* — This is the most common form of sterility and causes enormous losses in goat-breeding. Among 25 male goats examined by the writer, 22 had this defect.

The closing of the seminiferous ducts is caused by the induration of the cells of the testicle, epididymis or hilum, generally of all three at once. The induration process usually commences in the testicle, where the spermatozoa, owing to the closing of the seminiferous ducts, form calcified nodules.

Where a portion of the ducts is closed, the fertility of the goat is only affected, but if the whole of the ducts gradually becomes closed, the animal becomes completely sterile.

When the duct of the epididymis is entirely closed, the goat is completely sterile, even when large quantities of spermatozoa still remain in the testicle.

Goats with these defects generally retain the desire to cover, but as the seminal fluid containing no spermatozoa the female remain sterile. The disease is easily recognisable in its advanced stages, the testicles being very small and soft. The hilum is thickened, as is also the epididymis.

In the early stages, on the contrary, this disease is difficult to recognise without examining the seminal fluid.

Attempts to discover the fundamental cause of this defect have led to the conclusion that it is probaly hereditary. The sterility of male goats is a trouble met with everywhere but it is less common in some countries. In Germany, most sterile male goats are to be found in Hesse. Of the 25

... examined by the writer, 24 came directly from Hesse, or were the ... of parents born in that province.

When purchasing male goats for breeding purposes it is first necessary ... certain that the genital organs are well formed; animals should not ... sold till they are old enough to permit of conclusive examination. It ... is difficult to diagnose, recourse must be had to microscopic examination of the seminal fluid.

The article contains numerous illustrations of transverse sections of ... testicles.

Experiments in Swine Feeding at the Oregon Agricultural College Experiment Station. — WILTYCOMBE JAMES, POTTER ERMINE L. and SAMSON GEORGE K., in *Oregon Agricultural College Experiment Station, Bulletin* No. 127, 30 pp. Corvallis, Oregon, 1916.

The results of 24 experiments in pig-feeding made at the Agricultural ... of the State of Oregon during the last 10 years; the common feeds ... Oregon for the fattening of pigs were given to the animals. The ... is a summary of the results of some of the most interesting of ... experiments.

In one of the experiments, 10 high class pigs, 4½ months old, from ... bred Yorkshire sows and sired by a pure-bred Berkshire boar were divided into 2 lots which were as equal as possible. Both lots were fed ground ... while one received skim milk and the other shorts, as a supplement. ... total rations fed the 2 lots had the same nutritive ratio and were meant ... so as also to contain the same amount of nutritive substances. The ... ment lasted 62 days. The results are given in the table below. ... into account the expense of rearing and fattening and of the maintenance of the sow during gestation and the keep of the young pigs till the ... ning of the experiment, the feed cost for the first 100 pounds of live ... was $ 4.94. The cost of each further 100 lb. gain was $ 6.00 for the ... on shorts and $ 4.45 for the lot given skim milk, so that the total ... cost of each 200 pound pig was $ 11.03 in the case of lot I and $ 0.84 ... of lot II.

In another experiment, there were 3 lots of 10 pigs, each of which received the same ration consisting of ground barley 90 per cent and tankage (flour house refuse) 10 per cent. Lot 1, hand fed twice daily, ration dry; ... fed with self feeder, ration dry; lot 3, hand fed, twice daily, ration ... twelve hours before being fed. Throughout the experiment the ... of lot 2 made the most progress and gave the best final result after ... days of the experiment, as is seen in the table. This lot also consumed more food per head, while the amount of food necessary to produce 100 ... of live weight was less in this lot than in the 2 others. The largest ... in live weight per head daily was 2.44 pounds and the smallest ... 1.75; in both cases the pigs were barrows. The 10 best pigs were 7 barrows and 3 gilts (daily increase per head 2.44 pounds — 1.75 pound). Of the ... 5 showing the smallest gains in live weight (1.56 pounds — 1 pound) ... barrows and 5 gilts. The 10 pigs that were intermediate between ... 2 lots (1.73 — 1.56 pounds) consisted of 8 gilts and only 2 barrows. The

writers conclude from this that male pigs show a greater variability in weight than female pigs.

In the last experiment, 2 lots, each of 10 pigs, received a dry ration of 92 per cent of ground barley and 8 per cent tankage and were fed by self-feeders. The first lot were kept in a covered pen, while the second lot were allowed to feed in a clover field at will. The two lots were uniform as to the size, sex, breeding and quality of the animals. The experiment lasted 44 days and the results obtained are given in the following table:

Experiment	Lot of pigs	Live weight per head		Consumption of food per head daily			Increase in live weight per head daily	To produce 100 lbs. of increase: Consumption of food		
		Initial lbs.	Final lbs.	lbs. Shorts	Ground wheat	Milk	lbs.	Shorts	Ground wheat	Milk
I.	1	100	191	1.76	3.5	—	1.21	145	290	—
	2	103	205	—	4.1	7.2	1.64	—	246	439
II.	1	101.0	191.7		6.88		1.48		462.73	
	2	101.4	213.0		7.71		1.82		421.07	
	3	98.5	193.0		6.93		1.54		449.34	
				Barley	Tankage	Clover.		Barley	Tankage	Total
III.	1	89	157	5.530	.480	—	1.545	357.524	31.117	388.6
	2	89	173	6.429	.559	ad lib.	1.909	336.784	29.285	366.

422 – **"Clover Flour" as a Feed for Pigs.** — ZUR HERST V. A., in *Illustrierte Landwirtschaftliche Zeitung*, Year 36, No. 3, pp. 13-14. Berlin, January 8, 1916.

The "clover flour" sold in Germany for feeding pigs is made by grinding young clover which has been thoroughly dried previously. It is mixed with potatoes, beans etc.

In order to determine the food value of this new fodder, a feeding experiment was carried out with 10 sows, upwards of one year old, which had farrowed in the spring of 1915. During the summer and autumn of the same year, the animals were turned out to pasture, where they only received a small additional ration of young green clover and afterwards of roots. On October 28, the sows were put in the sty for fattening until the 25th. of the following November, their ration consisted of crushed beans, potatoes, fish meal, acorns and beetroots.

Its feeding value corresponded to that established by Kellner. The increase in live weight during this period was 0.44 kg. per head daily.

Calculating the value of the kilo at one shilling, the experiment resulted in a loss of £ 4.7.6 for the lot of 10 animals.

From November 25, the sows were given, instead of the beans, a ration of clover flour (starting with 2 litres, or .44 of a gallon per head at each meal) which was fed mixed with fishmeal and boiled potatoes, with the addition of cold water. This ration was given with some small modifications until December 19, on which day the experiment finished. During the experiment, the animals were always in good health.

During this second period, the live weight of the sows increased considerably, namely 1.38 kg. per head daily. The lot of 10 animals gave a profit of over £14.

Although this estimate does not allow for all possible expenses, it may be said that the productive value of the clover flour had proved excellent.

It is therefore considered that this new food, if fed with fish meal and boiled potatoes, is an excellent feed for fattening purposes.

On the Effects of Feeding Pituitary and Corpus Luteum Substance to Growing Chicks (1). — PEARL, RAYMOND (Biological Laboratory, Maine Agricultural Station) in *Proceedings of the National Academy of Sciences*, Vol. 2, No. 1, pp. 50-53. Washington, D. C., January 1916.

These experiments were carried out to determine the effect of pituitary substance on the function of egg production in the domestic fowl. Sixty-five pure-bred Barred Plymouth Rock pullets all hatched the same day were divided into three lots of 15 each. They were chosen so that the total weights of the three lots were equal. Pituitary substance (anterior lobe) contained in gelatine capsules with lactose was given to one lot at the rate of 0.082 gr., per bird per day. A second lot of pullets received the same amount of dessicated corpus luteum substance from pregnant cows and a third lot was kept as a control.

Though all the birds remained in a perfect state of health throughout the experiment, both the corpus luteum and the pituitary substance retarded the growth, the effect being greater in the case of the lot receiving corpus luteum.

There was no evidence that the pituitary substance hastened in any way the initial activity of the ovaries of the pullets.

Thus it appears that both glandular substances retard growth in the chick without affecting the date of sexual maturity or interfering with normal physiological development.

(1) **Two Pheasant Crosses.** — PHILLIPS JOHN C. in *The Journal of Heredity*, Vol. VII, No. 1, pp. 12-16, 3 figs. Washington, January, 1916.

In a preceeding paper (2) the writer described a reciprocal first cross between Reeves' pheasant and the common ring-neck pheasant (*Phasianus torquatus*). It was shown that the males differed very perceptibly in the two crosses, but of the females nothing could be learned because only one female was reared from the cross of male ring-neck female Reves', and none at all in the other cross.

(1) See also *B.* January 1915, No. 76; *B.* August 1915, N. 838. (*Ed.*).
(2) See *B.* February 1914, N. 155. (*Ed.*).

In order to find out whether these sterile reciprocal hybrids ... fered in the male sex, and also whether the females would show ... ences, another cross was carried out as a check upon the first ex... But in the second experiment, the Prince of Wales pheasant (*P. pr...* was used instead of the *P. torquatus*.

The *P. principalis* belongs to the dark-necked, red-rumped ... The striking features of the male are briefly as follows: neck-ring ... lesser and median wing coverts white, with white shaft stripes on ... coverts; rump and upper tail coverts orange red, with a few fine bl... tail barring reduced to faint lines.

The Reeves' pheasant, *Syrmaticus reevesii*, belongs to a monotypic ... The male is entirely unlike any of the true pheasants (*Phasianus*) ... coloring, and has a tail 3 or 4 feet long. The upper surface of the b... bright golden-colour, with black edgings to the feathers of the mantle ... and rump, while the breast and flanks are barred with white, black ... chestnut. The head is strikingly marked with black and white. T... female Reeves' pheasant shows some of the male characters in her ... pattern and the colors of her mantle, breast, and flanks.

The two species crossed are therefore wholly unlike in both sexes ... in all plumages, and always produce absolutely sterile hybrids. In 1911 ... Reeves' cock was mated with two Prince of Wales females (Pen *J* 1914 ... a Prince of Wales cock was placed with a couple of Reeves' females (P... *K* 1914). Both these parent stocks were inbred and came from the... grandparents.

From Pen *J* nine birds were reared to maturity, four males and ... females, and from Pen *K* one male and three females. Comparing the ... pens of males and the two pens of females we get the following res...

In the 1914 cross, Reeves' male × Prince of Wales female (cross ... and in the reciprocal cross (*K*) the sterile male hybrids are similar ... closely approximate to the slightly different reciprocal hybrids of the Reev... × ring-neck experiment of 1912. With the females, however, of t... two first mentioned crosses, there are almost no points in common. I... cross *J* they are small, female-like, and very close to the Reeves female ... their colouring. In cross *K* they are large and male-like, with pattern ... coloring of both the male parents. No trace of a sex gland was found ... any of these females, but a small and thin-walled oviduct was always pres...

It is possible that these facts may be explained on the basis of s... linkage, with the assumption that the eggs are dimorphic, and the sper... monomorphic for sex and sex linked characters, but no proof is availab... on account of the impossibility of testing the sterile hybrids.

Rough measurements of the spleen cells failed to reveal any difference ... their size betwen *K* and *J* females.

425 - **Laying Competition at Burnley.** — BROWN EDWARD, in *The Journal of the ... Agriculture*, Vol. XXII, No. 7, pp. 658-662. London, October 1915.

For nine years, the Northern Utility Poultry Society, which is large... composed of artisans in a great manufacturing centre, has conducted ...

competitions. The competition described in this article extended from October 15, 1913, to October 4, 1914.

In no part of the United Kingdom has the keeping of poultry for egg production, as a supplementary pursuit, been developed during recent years to a greater extent than around Burnley. The development has been more or less intensive in its nature owing to local conditions (high cost of land, the fact that all food must be provided, large local demand and high prices paid for eggs), and the average productiveness of the hens is of supreme importance, since without increase of fecundity, the margin of profit would be insufficient.

In view of the desirability of encouraging egg production in industrial districts, the Burnley example is of considerable value, and these laying competitions have exerted a wide influence.

For the purpose of the competition of 1913-14 a small holding of three acres was rented. The competition was arranged in 4 sections :

1) *Small House Section.* — The ordinary small house was used in this section : 12 ft. by 8 ft. and 5 ft. 6 in. high at the eaves, rising to 8 ft. in the centre, with a run allowing 30 sq. yds. for each bird.

2) *Semi-Intensive Section.* — A large flock was located in a house measuring 36 ft. by 15 ft. high at the eaves, rising to 11 ft. in the centre and allowing 3 1/2 sq. ft. of floor space for each bird. Outside was a run divided into four sections for alternate use.

3) *Local Section*: restricted to competitors within a radius of eight miles of Burnley, the houses used being similar to those in No. 1.

4) *Dry Feeding Test* : in which were birds representing 4 noted laying strains.

Each of the small houses used accommodated 234 birds ; in Section 2, 260 birds were placed in the large house, grouped into two lots, heavy and light breeds respectively. Each competitor in the open sections was required to enter 8 birds, 4 in the Small House Section and 4 in the Semi-Intensive Section. Comparisons between the two can be made, as the feeding and other conditions were the same, the only differences to be noted being as regards the size of house and the number of inmates.

The following table shows the differences as to average number of eggs laid per hen.

It is evident that the smaller flocks (small houses) yielded a larger number of eggs in winter, though the differences are small in the aggregate. Except in one case, this difference is more apparent with heavy than with light breeds. How far the better results obtained with the small houses make up for the greater cost of equipment and of labour, requires further test.

The Dry Feeding Test did not prove successful ; the 16 birds never presented the same bloom and vigour as the others, especially during the winter. The dry feeding consisted of equal parts of bran, biscuit meal, chaps, ground oats and biscuit dust with 10 per cent of fish meal as a dry mash, and of equal parts of wheat, oats, cockle and kibbled maize, or brown barley mixed and given in an automatic feeder.

Average Number of Eggs Laid per Bird Annually in the Sm and the Large Houses.

Breed	Number of Pullets	Number of Eggs in Large House	Num in Sm
White Wyandotte-	48	174.62	1
Buff Orpington-	16	130.75	1
Buff Rocks	4	140.25	1
Rhode Island Red-	4	181.00	1
White Leghorn-	68	166.30	1
Anconas	16	181.81	1
All Breeds	156	167.13	1
Heavy Breed-	72	164.65	1
Light Breeds	84	169.23	1

During the competition, which lasted 1 year, 71 709 eggs were p duced; of these 13 526 (or 18.86 per cent) were laid in the winter (October to January inclusive), this percentage being distinctly above average. The cost of food under such conditions must always be fa In this competition it worked out at 7*s.* 4*d.* per bird, per annum. The lue of eggs sold per bird was 10*s.* 3*d.*, and the average price was 1*s.* 4 per dozen.

1520 **The Ancestry of the Goose.** — *The Journal of Heredity*, Vol. VII, No 3 figs. Washington, January 1916.

The ordinary breeds of domesticated geese are the slightly mod descendants of the grey lag goose (*Anser anser* L.) which is still found throughout northern Asia, although nearly extinct in Europe. It already been domesticated at the most remote period of civilisation. T appears to be in *Anser anser* and its tame descendants, as well as in the C nese species (*Cygnopsis cygnoides*), a strong tendency to the produc of white mutants and from these the white variety of both species has b created. As a rule, the changes due to domestication (waddling a lessened ability to fly and deeper rump) are those that would natu be produced by selection of specimens possessing the best marketable

The American Standard of Perfection recognises the following bre of geese: Toulouse (gray) Embden (white), African (gray), Chinese brown and white varieties), Wild or Canadian (gray) and Egyptian col ed). Of these, the "Toulouse" seems to have been produced in Franc its plumage much resembles that of *A. anser* but the colour pattern is pler. The Embden" has been obtained by North German breeders and around Westphalia by selecting white "sports" and breeding fr

The history of the "African" breed is somewhat uncertain. It is [illegible] a cross between the Chinese goose, the Toulouse breed and some[illegible] the Embden. The fleshy protuberance on the beak is characteristic of domesticated forms of the Chinese species, also the black stripe [illegible] the back of the neck, while the plumage resembles to some extent that of the Toulouse goose. The 3 above-mentioned breeds are heavy weight market varieties, weighing from 17 to 25 lb. when properly fattened.

The Egyptian breed comes from an entirely different species (*Chenalopex aegyptiacus*) which has been of much importance to the domestic economy of Egypt ever since the beginning of history.

The Canadian goose is the domesticated wild goose of North America (*Bernicla Canadensis*). It is easily tamed, but has little commercial importance as a domesticated breed. The Chinese goose (*Cygnopsis cygnoides*) is a good layer and furnished a good quality of meat; it is the largest of all wild geese and weighs from 10 to 14 lb. It is yearly becoming more popular in the United States and deserves to be widely kept. All these species may be interbred freely in captivity.

Parthenogenesis in the Silkworm. — LEGALLOIS A. in *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, Vol. 162, No. 7, pp. 241-246. Paris, February 10, 1916.

Observations made in June 1914 and June 1915 (with moths of the Sicilian bivoltine breed) with a view to solving the vexed question of the parthenogenesis of *Bombyx mori*. The following conclusions were drawn:

1) Oviposition in the case of females that cannot mate becomes very irregular.

2) A certain number of unfertilised eggs can undergo changes in colour similar to those shown by fertilised eggs which develop normally. This is in agreement with previous observations.

3) Shaking unfertilised eggs is incapable of increasing the number that change their colour. In this experiment the eggs were placed in cardboard boxes immediately after they were laid and shaken vigorously for 5 minutes and again several times during the next 3 days.

4) The action of sulphuric acid (diluted in an equal volume of water and allowed to act for 5 minutes on unfertilised eggs) is also negative.

5) It seems logical to conclude, as all previous workers have done, that the changes of colour undergone by certain eggs are a proof that parthenogenesis occurs in the case of the silkworm; only a cytological study, however, is capable of deciding the question definitely.

Food of the Rainbow Trout (*Salmo irideus* Gibb.) in Alpine Lakes. — KAISER, Ulrich L. and FEHLMANN J. W., in *Schweizerisch. Landwirtsch. Zentralbl.*, Year 23, No. 12, pp. 309-325. Pfäffikon (Zürich), December 1915.

A preliminary account of observations made early in October 1915 at the Hydrobiological Station at Davos (Switzerland). (1).

(1) See *B.* March 1916, No. 320.

The fish under observation were 5 months old and were der[illegible] the hatchery at Heuweise, near Buchs. The plankton of L[illegible] which forms the food of the larvae is chiefly composed of species [illegible] *nia*, *Cyclops* and a Centropogid *Diaptomus denticornis* Wierz. [illegible] ter, which is red in colour owing to its carotin content, forms [illegible] the entire food of the rainbow trout. Not only are the stomachs [illegible] completely crammed with specimens of this crustacean but their [illegible] are coloured a vivid red by the carotin.

This is all the more curious in view of the fact that *Daphnia* [illegible] much greater proportion of the plankton of the lake than *Diapt[illegible]* being sluggish in its movements, is much more easily caught than *[illegible]* *mus* which is a good swimmer and very active. Parallel experiments [illegible] the fry of the common trout (*Trutta fario*) have shown that this latter [illegible] is more catholic in its tastes.

This observation is regarded as being of considerable importance [illegible] throws light upon some common, but hitherto obscure, phenomena [illegible] also confirms the results of several other authors. DR. G. STUHLMANN [illegible] article on the stocking of alpine lakes with rainbow trout has already [illegible] gested that the red colour of the trout in lake Sul is due to the [illegible] of large numbers of *Diaptomus*. Unfortunately, he omits to give the [illegible] name of the species, which might possibly be *D. bacillifer* Koelbel [illegible] latter also shows the characteristic red colour. At the same time it [illegible] be assumed that *D. denticornis* was the species concerned, as *D. ba[illegible]* lives chiefly at altitudes ranging from 7900 to 8900 feet and, according [illegible] ZSCHOKKE, has only been found three times at a lower altitude than 5[illegible] whereas lake Sul is only 6320 feet above sea level. Further the two [illegible] never occur together. More recently, LÄGER has concluded, from his [illegible] iments on the stocking of alpine lakes that, contrary to the prev[illegible] opinion, the rainbow trout is the best species for this purpose.

In view of the fact that the rainbow trout of Lake Davos possesses [illegible] same red flesh as those of Lake Sul and that *Diaptomus denticornis* [illegible] practically the entire food, not only of the fry, but probably of the [illegible] fish also, it may be concluded that the red coloration of the flesh of [illegible] rainbow trout in the alpine lakes is derived from *Diaptomus den[illegible]*

We thus have the reason why the rainbow trout, contrary to expe[illegible] tation, does not leave Lake Davos, notwithstanding the fact that this [illegible] ter has an outlet and the flow of the water is favourable. It is [illegible] the fish find food to their taste such as does not occur, for instance, in [illegible] lakes of the plain, in spite of their richness in insects, larvae, small fish [illegible] This theory is confirmed by the fact that the rainbow trout does not [illegible] leave the lakes of the plain as a one or two year old fish, but only at m[illegible] rity or thereabouts, as if it were then anxious to find a spot which w[illegible] ensure a suitable food supply for the larvae.

The point of practical value in connection with these observ[illegible] is that henceforward it will be possible to determine immediately whe[illegible] or not an alpine lake is suitable for stocking with the larvae of *Salm[illegible]*

Where the plankton is shown to contain *Diaptomus denticornis* species will succeed well.

The red colour of *Diaptomus* cannot be the reason for the larvae preferring this species to the exclusion of all others but less obvious factors must be concerned, either of a purely mechanical or possibly of a biochemical nature. Undoubtedly, *Diaptomus* should be the cause of much more rapid growth on the part of the fish as, owing to their preference for this species, they eat considerably more than they would otherwise do.

Cyclops and *Daphnia* are thus only eaten by young rainbow trout when there is nothing better to be had. If, however, the fish make such a strict selection from among the living plankton, it is obvious how little success must be made by such substitutes as pieces of spleen, brain, liver, fish meal etc. The degeneration observed in the fish of the waters of the plain is possibly due to the unsuitable diet in their early stages. In Lake Geneva this degeneration has not been observed. It follows from this that the hatcheries which can feed their larvae with *Diaptomus denticornis* will furnish the healthiest and quickest growing fish. Breeding of *Salmonidae* should therefore only be carried out in the alpine lakes and not in the plain. This method should enable breeding trout from alpine lakes to be substituted for those imported from their native waters, often at considerable expense, in order to reinvigorate the population of the waters of the plain.

FARM ENGINEERING.

Chaff-cutter with Curved Blade and Plate for Packing the Straw *Illustrirte Landwirthschaftliche Zeitung*, 32nd. Year, N° 10, pp. 69-61 + 4 figs. Berlin, Feb. 7, 1912.

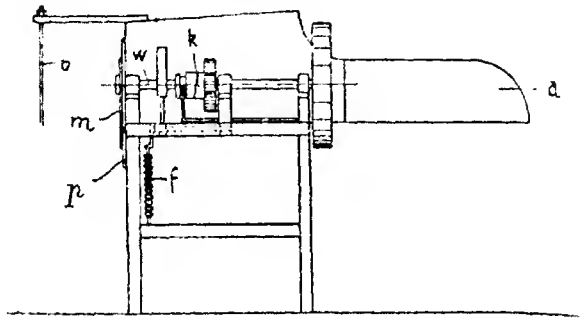
The chaff-cutter patented by the firm of Heinrich Schrameyer of Halsten, near Osnabrück, Germany, (German patent N° 280 461) differs from others already in use, through the fact that the plate for compressing or packing the straw forms part of the feeding tube, being joined to the lower portion of this latter and pressing the straw against the side opposite, nearest to the blade. By means of this arrangement, the sheaves are well chaffed without having been previously opened out, *i. e.* just as they come in from the field.

The chaff-cutters employed hitherto have the following drawback: when cutting is begun, the sheaves being tied round the middle their ends only partially fill the orifice of the feeding tube, and they are consequently pressed unevenly in the plane of the blade. This latter does not meet with the resistance necessary for clean cutting and as a result a portion of the straw is crushed and torn instead of being properly cut.

To overcome this difficulty, in the new chaff-cutter the packing plate is arranged in such a way that directly the blade begins to act the plate presses the straw against the opposite side of the feeding tube and ensures a clean cut.

Fig. 1 shows the machine in side view and fig. 2 in front vie[illegible] and 4 show the method of working of the packing plate and of t[illegible]

Chaff-cutter with Curved Blade and Plate for Packing the S[illegible]



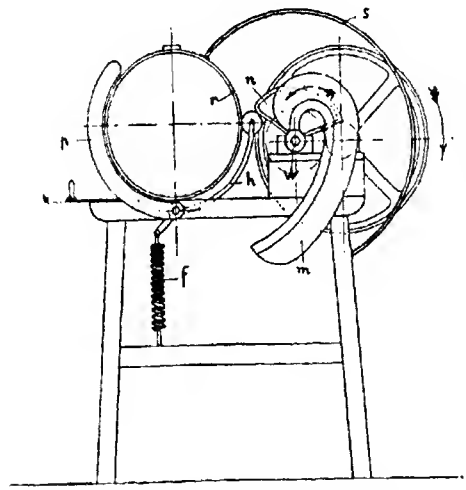


Fig. 1. — Machine in side view.
Fig. 2. — Machine in front view.

in fig. 3 the straw, still in its loose condition, does not completely fill the [illegible] terior of the feeding tube and neither plate nor blade have yet begun

In fig. 4 the packing plate has pressed the end of the sheaf against the opposite wall and the blade has begun to act.

Examination of the figures shows that (fig. 1) the curved plate *a* on which the sheaf is placed is followed by a cylindrical tube *r*, into which the straw is fed until stopped by a plate *b* adjustable according to the length cut required. A curved plate *p* (figs. 2-3-4) is hinged to the lower part

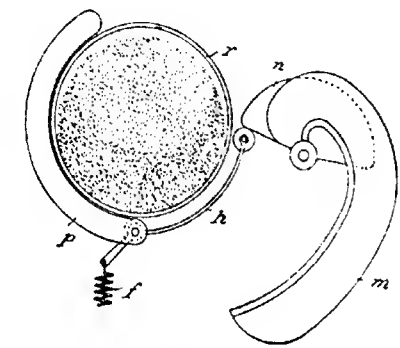


Fig. 3

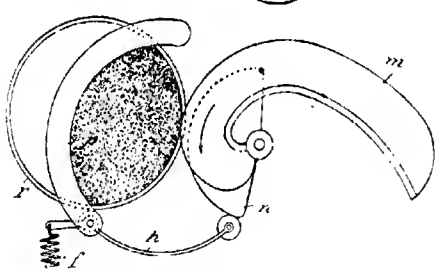


Fig. 4

Fig. 3 and 4. — Mode of action of blade and packer.

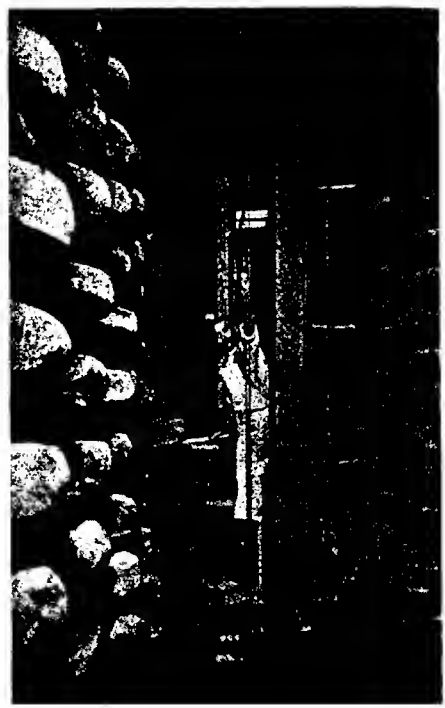
of the feeding tube and is maintained in the open position by means of a helical spring *f*. A curved arm *h* is connected with the plate *p* and through the agency of a roller presses against the cam *n* mounted on the shaft to which the blade *m*. This latter, revolving in the direction of the arrow, grazes the plate *p* in scissor fashion; the knife is worked by a gear driven off the pulley. The bush *k* (fig. 1) enables it to be thrown in and out of gear at will. The blade is protected by a guard *s*.

Apparatus for the Cheese Curing Room. — *Schweizerische Milchzeitung*. Year 42, No. 14, p. 3. Schaffhausen, February 18, 1916.

Hitherto all the work of salting and cleaning cheeses in curing or store rooms required a good deal of labour, as every cheese had to be removed

from the shelves, carried to a table to be treated and then put back in its place, all by hand. When large and heavy cheeses have to be [illegible] two or three times a week the work becomes especially fatiguing [illegible] the cheeses on the upper shelves are often 10 or 12 feet from the ground.

M. DAVID LÖRTSCHER of St Gallen, the inventor of the cheese-turning apparatus "Merkur" at present in general use, has devoted some [illegible]



Apparatus "Mars" for the manipulation of heavy cheeses

to the study of the problem and has now invented the portable cheese-turning table "Mars" worked by hand or power, which effectively saves the amount of labour in the curing or store room.

The apparatus, shown in the accompanying figure, consists of a kind of lift mounted in a frame on rollers, so as to be easily moved in the [illegible]

between the rows of shelves. The lift platform is suspended by two strong wire ropes between two uprights.

Part of the platform is occupied by a cleverly constructed salting table provided with a device for turning the cheese over, leaving sufficient space for the workman. A 1 ½ HP. electric motor is sufficient to propel the whole apparatus forwards and backwards, or to raise close up to the top shelves or lower to the ground the platform and salting table together with the man and three heavy cheeses. The lift is fitted with automatic stops. The salting table and the platform are provided with rollers covered with rubber and worked by electricity.

When the table has been lifted to the proper height the rubber roller of the table is placed under the part of the cheese projecting beyond the shelf. The roller is set in motion and draws the cheese into the table where it is treated. By a simple device the heaviest cheeses are turned over without any exertion on the part of the operator, and by reversing the motion of the roller the cheese is returned to its place on the shelf. For the lower shelves the table is removed, the platform itself acting as table, being provided with the necessry rollers and turning device.

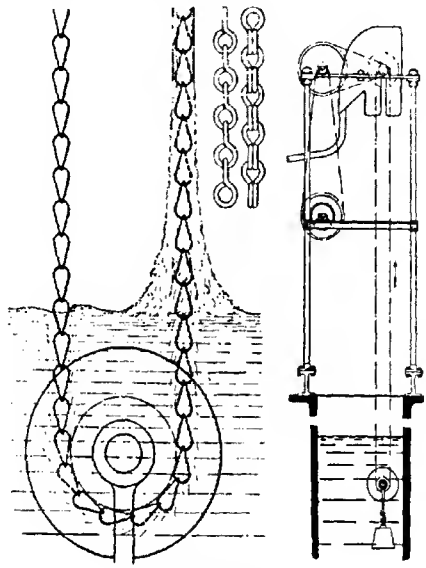
As electric power is not everywhere available this apparatus is also constructed for hand power. It is built in different sizes to suit any height and width of passage.

Chain Pump or Conveyor. — *The Practical Engineer* Vol 53, No 1367, p. 30 London, January 13, 1916.

A number of chain pumps have already been devised, some consisting essentially of tubing fitted with piston disks, the chain merely connecting the disks, others of series of little buckets, and others again of a compound endless chain — carrying the liquid by capillarity and adhesion — which is formed by a central chain surrounded by two metal wire helical springs. Messrs J. C. GRANT and A. JARVIS have now found by experiment that water either alone or carrying solids in solution or suspension can be very efficiently lifted by a simple bare chain, though the quantity varies considerably with the pattern and size of the chain. The form of chain found most suitable is the double jack chain, of which a few links are shown in the accompanying illustration, each link having a single and a double loop in planes at right angles to each other.

The example illustrated is for raising water from a well. A small pulley having a V groove is mounted on a shaft supported on a framework over the well and driven by a hand wheel. Over the pulley passes an endless chain long enough to descend beneath the level of the water in the well and passing round a submerged weighted pulley, also V grooved. The upper pulley is mounted in a casing with a chute into which the water is discharged. On rotating the chain rapidly, the rising run lifts the water which forms a cone shaped mass at the surface and gradually assumes a cylindrical form round the chain. The upper pulley must be of small diameter to give a sudden change and direction to the chain and throw off the water. The submerged pulley may be of ample diameter. Sand and water even

in the proportion of 6 lbs. to a gallon can be readily lifted by ; system, which has been patented.



Chain for conveying water.

432 - **Review of Patents.**

Tilling machines and implements

Denmark	20 842.	Device for motor ploughs.
Italy	150 283.	Motor plough.
	150 689.	Improvements in the winding drums used for steel ploughing.
	150 851.	Harrow.
Spain	60 913.	Plough beam.
	61 155.	Plough with twin bodies and only one mouldboard.
	61 185.	Improvements in disk harrows.
Sweden	39 624.	Device for cultivators.
Switzerland	71 775.	Garden implement.
United States	1 164 771.	Stalk cutter.
	1 164 792 — 1 166 144.	Cultivator attachment.
	1 165 097 — 1 168 135.	Motor plough.
	1 165 213 — 1 165 857.	Harrows.
	1 165 267.	Reversible disk plough and cultivator.

1 105 297. Ditching plough.
1 105 527. Harrow attachment for gang ploughs.
1 165 808 — 1 166 169 — 1 166 207 — 1 167 983. Ploughs.
1 166 135 — 1 166 440 — 1 167 122. Cultivators.
1 166 195. Cotton chopper and cultivator.
1 167 429. Motor plough and cultivator.
1 167 645. Weed cutter and pulverizing machine.
1 167 969. Combined drag and harrow.
1 168 158. Combined lister and fertilizer distributor
1 168 201 — 1 168 202. Wheel cultivators
1 168 208. Wheeled plough

Manure distributors

150 630. Rake fertilizer distributor
States 1 165 490. Fertilizer distributor
1 166 632. Straw spreading attachment for manure spreader.
1 165 642. Manure loader.

Drills and sowing machines.

ark 20 861. Drill
" 39 563. Share for drills
Kingdom 19 756. Potato planting and manure distributing machine.
States 1 166 477 — 1 167 813. Seed and fertilizer distributor.
1 166 502 — 1 166 902. Planters.
1 167 438. Check-row corn planter.
1 167 545. Drill attachment
1 167 551. Disk grain drill.
1 167 602. Seed feeding apparatus for cultivators with disks and elastic teeth.
1 167 907. Potato planting attachment.

Reapers, mowers, and other harvesting machines.

ark 20 793. Canvas conveyor for binders
20 821. Horse rake and stacker.
20 848. Reaper.
20 877. Sheaf carrier for reapers.
otland 71 666. Device for lifting the cutter-bar of mowers and throwing them into and out of gear.
71 776. Apparatus for sharpening scythes.
d Kingdom 19 707. Sheaf binding harvesters.
d States 1 164 691. Cutter bar for harvesting machines.
1 164 713. Mowing machines.
1 165 169. Guard means for the cutting mechanism of binders, mowers etc.
1 165 319 — 1 165 650 — 1 166 329. Grain shocking machine.
1 165 758. Corn harvester.
1 166 136. Side-delivery rake.
1 166 594. Hay unloader.
1 166 963. Attachment for hay rakes
1 167 213. Seed harvesting attachment for mowing machines.
1 167 651. Hay loader.
1 167 739. Grain loading machine.
1 167 911. Grain carrier for harvesters.

Machines for lifting root crops.

United States	1 166 083. Machine for topping beets.
	1 166 762. Beet harvesting machine.

Threshing and winnowing machines.

Spain	60 887. New threshing machine.
	61 014. Machine for winnowing and grading all kinds of grain.
	61 269. Elevator riddle adaptable to any system of threshing.
	61 270. Improvements in threshing machines.
United States	1 165 241. Threshing machine, maize sheller or like machine.
	1 165 786. Threshing machine.
	1 166 647. Corn husking machine.
	1 166 730. Pea and bean thresher.

Machines and implements for the preparation and storage of grain, fodder etc.

Spain	60 877. Frames for baling hay, straw cotton, cork etc.
Switzerland	71 913. Electrostatic groats cleaning machine.
United States	1 164 922. Baling press.
	1 167 858. Alfalfa meal grinder.
	1 167 871. Ensilage protector.

Dairying machines and implements.

Denmark	20 813. Pulsator for milking machines.
	20 849. Milking machine.
	20 855. Drum for separators.
Netherlands	1 053. Implement for treating milk for the preparation of cheese.
United Kingdom	20 417. Cow milkers.

Other agricultural machines and implements.

Denmark	20 829. Peat kneading machine.
British India	2 186. Improved methods of separating fibres from seeds and other matter and apparatus thereto.
Italy	150 211. Pincers for marking live stock.
	150 819. New sprayer for insecticides and anti-mildew liquids.
Spain	60 945. Filtering plates for beetroot filtering presses.
	60 975. Machine for cutting cork slabs into sheets.
	61 010. Boring machine for discovering water at small and constant depth.
	61 084. Improvement in machines for sharpening the knives of machines for cutting cork disks.
	61 267. Apparatus for the carriage of bananas.
Sweden	39 438. Overhead carrier for stables.
Switzerland	71 877. Device for tying up vine canes.
	71 878. Device for untying live stock in stables.
United States	1 165 481. Steering device for tractors.
	1 165 708 — 1 166 246. Tractors.
	1 165 930. Motor driven tractor.
	1 167 302. Traction engine.

Small Circular Reservoirs in Reinforced Cement. — PARIS, RAFFAELE, in *Giornale [illegible] della Domenica*, XXXIIIth Year, No. [illegible], pp. 68, 3 figs. Piacenza, Feb. 27, 1913.

The system proposed by the writer consists essentially in the construc[illegible] of 2 walls of reinforced cement which form the sides of the embank[illegible] These latter are connected transversely and thus ensure stability

Impermeable clay bottom.

Fig. 1. — Vertical section through reservoir

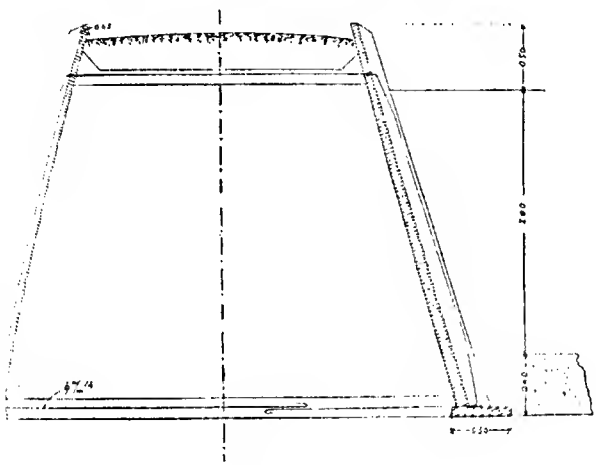


Fig. 2a. — Vertical section of earth-filled embankment

[illegible]hout the necessity for constructing the ordinary embankments which [illegible]s so much more costly.

By means of this system, the weight of earth necessary to oppose a [illegible]t volume of water may be reduced to a minimum; the walls of reinforc[illegible] cement render the sides impermeable. By covering the bottom with [illegible]ayer of clay this latter is also rendered waterproof and the heavy expen[illegible]s in connection with foundations are divided. As shown in Fig. 2, the [illegible]ls are formed of cement tiles which may be reinforced with a network [illegible]metal. The tiles are strengthened at the cross joints by means of ribs; [illegible]ir length is thus limited to the distance between the said joints.

The expenses necessary for a plant sufficiently large to irrigate 61.8

acres supplying 5710 cubic feet of water per acre every 10 days ar[illegible] ed at a little less than £400. Of this sum nearly £80 is req[illegible] motor pump, estimating a difference in level of 82 feet and a fl[illegible] gallons per second, and £278 for the construction of a reservoir [illegible] cubic feet capacity (1).

434 · **Effect of Temperature on the Strength of Concrete.** — *Engineer*[illegible] No. 2614, p. 109. London, February 4, 1916.

Much uncertainty still exists as to the time required before the [illegible] can be removed from reinforced and other concrete works, and loads [illegible] with safety.

With a view to contributing to the solution of the problem Mr. A. Mac Daniel has made some interesting experiments at the Engineering Experiment Station of the University of Illinois in order to test the [illegible] of temperature on the rate of increase in strength in concrete.

For this purpose over 150 cubes and cylinders of concrete were ma[illegible] and stored at mean temperatures ranging from 20.5° to 90.6° Fahren[illegible] and tested after intervals of from 3 to 28 days. The concrete used [illegible] 1 part by weight "Universal" Portland cement with 2 parts sand [illegible] 4 parts crushed limestone, corresponding to 1 : 2.2 : 3.6 by volume

The moulds were 6 inch cubes or cylinders 6 in. in diameter and [illegible] long or 8. in. in diameter and 16 in. long.

Some of the specimens were moulded at the temperature at which [illegible] were to be stored, most of them, however, were moulded in the labora[illegible] and taken to the storage rooms after setting for 6 hours. In all cases [illegible] were kept moist. The figures obtained for the cubes were multiplied [illegible] 0.73 to make them comparable with the data obtained for the long [illegible] linders.

At low temperatures the strength was found to increase slowly, provi[illegible] the specimens were not alternately frozen and thawed, as this caused dis[illegible] tegration. At ordinary and comparatively high temperatures, higher crush[illegible] ing stresses were reached in a given time and generally the stress seems [illegible] increase with the storage temperature.

The average stresses obtained with specimens stored at a mean temper[illegible] ture of 48.5° F. were 800 lb., 1130 lb. and 1410 lb. per square in. respectiv[illegible] after 7, 14 and 28 days, while for a set stored at 72.8° F. the figures were [illegible] 1210 and 1530 lb. per sq. in. for the same periods.

As a result of these experiments Mr Mac Daniel concludes that for c[illegible] crete hardening at from 60 to 70° F. the ratios of strength at 7, 14 and [illegible] days to the strength at 28 days may be taken as about 0.5, 0.75 and [illegible] respectively. The ratios are higher for high temperatures and lower [illegible] low temperatures. The actual strength of concrete after 1 week at a tem[illegible] perature of 60 to 70° F. would be practically double that of the same mate[illegible] kept at from 32 to 40° F.

(1) See also R. Cappelli and A. Bruttini. I serbatoi Cappelli in *Bollettino della Società degli Agricoltori Italiani*, XVth Year, No. 2, Rome, January 31, 191[illegible]

A diagram accompanying the article gives, with a fair degree of approximation, the strength attained by concrete kept at temperatures between 50° and 90° F. for periods ranging from 3 to 28 days.

Extensive Use of Silos in Kansas, U. S. A. — Nichols, J. B., in *The Country Gentleman*, Vol. LXXXI, No. 3, p. 108. Philadelphia, Jan. 15, 1916.

There are now more than 10 000 silos in the State of Kansas; in 1909 there were only 100. The leading silo counties are in the most prosperous districts. For example, Sedgwick, an especially rich county, has the lead with 572 silos, Reno comes next with 333 while Lyon and Summer have 300 each. The greatest percentages of increase are found in the western counties. For example, the gain in Meade County in 1914 was 600 per cent; Barton 336; Rooks 244; Clark 210; Pratt 144; and Ford 142 per cent. This rapid increase is due largely to the activity of the State Experiment Station, which has demonstrated that silage from sorghum and kafir corn has a high a feeding value as that from maize. For instance, the average yield of Kansas orange sorghum at the Station farm at Manhattan for the last two years has been 18 tons an acre. Fields of 12 to 15 tons an acre of sorghum and kafir corn in the eastern part of the State are common; in most all cases these yields are much larger than those of corn. The average yield decreases as one goes westward, but good yields of silage are secured from the sorghum most years as far west as the Colorado line.

An even greater increase in silo building is expected in the future.

RURAL ECONOMICS.

Cash-renting and Share-renting in Missouri, United States. Johnson, O. R., in *The Country Gentleman*, Vol. LXXXI, p. 18. Philadelphia, January 1, 1916.

In a farm management survey made in Northwestern Missouri, figures gathered on the 669 farms showed that the average share tenant made $ 1,5 greater net income than the cash tenant, and that a share of the crop gave the landowner 1,3 per cent higher interest on his investment than was received by the owner who rented for cash.

The following averages were obtained:

a) the total net income of the average tenant who rented all his land on a share basis was $ 548, the owner receiving 4.9 per cent;

b) the average cash renter made $ 410 and paid a rental that returned 5.0 per cent to the owner;

c) the tenant who rented his crop land for a share and his grassland for cash made a net income of $ 597; the owner received 5.9 per cent on his investment.

Labor Income in Minnesota, United States. — *The Country Gentleman*, Vol. LXXXI, No. 1, p. 18. Philadelphia, January 1, 1916.

In Rice Country, Minnesota, records were taken from 400 farms in 1911 to determine the relation between the numer of units of labor on a farm and the labor income

A unit of labor consists of ten hours of man labor or twen
horse labor.

Labor income is the amount earned by a farmer in excess o
of the farm produce used by his household, and of farm expen
terest on the investment at five per cent.

Dividing the 400 farms into groups according to the numb
units of labor, we have: for the first group of farms with less tha
of labor, a labor income of $ 97; for the second group of farms
401 to 600 units of labor, a labor income of $ 267; for the third
farms with more than 1,000 units of labor, a labor income of $

The efficiency of man labor is even more important than th
of time expended.

The labor income gradually increased from $ 5, where the
each man for a year were 1500 or less, to $ 633, where the hours
man were more than 3500 each year.

The above results indicates that a farm business of more than
size gives opportunity for high efficiency of man and horse labo
farm business of more than average size coupled with high labor e
brings profits in farming.

138 - **Advantage of Diversity in Farming Operations in the Central Wheat Belt Kansas.** U. S. A. — JOHNSON E. C. in *The Breeder's Gazette*, Vol. LXVIII, N
Chicago, December 30 1916.

At the initiative of the Harvey Co., Kans., Farm Bureau
were made on 70 farms in Macon township, a typical wheat section
country, by P. E. Mc Nall and County Agent F. P. Lane, in orde
termine the influence of the high price of wheat on the farmers' l
come, and to ascertain whether the high prices quoted in the Chica
ket ($ 1.65 a bushel in Feb. 1915) were due to the farmers holdin
wheat to secure extortionate prices.

Regarding the second item, the survey has shown that in Sept
1914, 82 per cent of the wheat crop had already been sold at the ave
price of 90 cents per bushel, that is 12 cents more per bushel than the
age received for wheat in this section for the last 10 years, not inc
1914. This, together with the exceptionally large yield of 26.2 bu
per acre, as compared with an average yield for Harvey county for th
10 years of 15 bushels per acre, made it possible for the wheat farme
realize a high labor income for 1914.

The average farmer in the comunity made a labor income of $
and, in addition, realized 5 per cent interest on a capital of $ 22 7
these farmers, however, had produced a yield of only 15 bushels pe
and had received 78 cents per bushel, which were the average yield
price for this area for the last 10 years, their labor income would have
only $ 451 per farm.

The income of the 15 better-paying farms amounted to 5 per ce
terest on an investment of $ 28 602 and, in addition, a labor income
$ 3117 per year; these farms growing an average of 138.2 acres of wh
with an average yield of 26.2 bushels per acre.

... 11 of the better-paying farms, however, receipts from cattle aver... $ 1021; on 8 of the farms receipts from swine $ 1007, and on 7 farms ... receipts amounted to $ 514, so that all this income must not be ... to wheat.

In fact, the 15 better-paying farms had 3.7 enterprises per farm which ... over $ 200 per enterprise, while the average farm in the section ... only 2.7 enterprises which returned over $ 200 per enterprise. This ... strong argument for diversity in the farming operations, even during ... of unusual yield of wheat and when the price is above the average.

Cultivation of the Bamboo as a Profitable Commercial Enterprise. GIRARDI, G., in *Bollettino della Società Ortícola Varesina*, Year III, No. 28, pp. 5-8; No. ..., pp. 5-8, ... pp. 5-8; No. 31, pp. 5-8. Varese, January 1916.

Data from experiments made by, or under the control of, planters in ... The same data are confirmed in Japanese publications dealing ... the bamboo as a plant of economic importance.

The following is an account of the average expenses and receipts for ... plantation of 1000 plants, occupying an area of practically 1 acre; the ... covered is 10 years and no account is taken of interest:

Expenses.

	£	s.	d.
Buying of plot of ordinary land, about 1 acre	7	11	1
1000 bamboo plants of various types	31	13	1
Plan-plantation and manuring	10	16	6
Various unforeseen expenses	1	1	
Taxes, 10 years	10		
Harvesting the stems of the 4th and 10th years' growth	15	0	
Total expenses	116	19	8

Receipts.

	£	d.
1 [illegible] 1000 stems in 4th year, at 6s. 3d. per 100 [1]	1	13 4
[illegible] " 5th " "	10	
[illegible] " 6th " "	28	10
12,000 " 7th " "	38	
15,000 " 8th " "	47	10
17,000 " 9th " "	53	
21,000 " 10th " "	66	10
3000 extra-strong canes exceeding 2 inches in diameter, at £2, 7, 6 per 100	71	5
Total receipts	310	8 4

[1] The minimum price paid to growers is really 7s. 11d. per 100.

The bamboo stems sold by the big grower should be some 10 [illegible] picked stems averaging 19 ½ to 29 ½ feet in length. There [illegible] the tops for which there is considerable demand among hoop- [illegible] and basket manufacturers who are prepared to pay them 1s. 7d. [illegible] per 100, according to the diameter. Including this secondary [illegible] therefore, a plantation may be said to produce, between the 4th [illegible] year, nearly £ 1000 worth of stems.

According to the price lists of the chief French firms exporting [illegible] stems the average retail prices for canes of various lengths are as [illegible]

Length	Width	Price per 100
metres	millimetres	£ s. d.
0.60	6	1 5
0.90	6-8	1 7
1.10	6-8	2 0
1.20	8-10	2 9
1.30	10-12	3 6
1.80	12-15	09 6
1.80	18-22	17 5
2.00	12-15	11 1
2.00	18-22	19 10
3.50	35-55	4 16 1

On the basis of these prices, the writer calculates that in the estima[illegible] of the value of the bamboos produced by a plantation the standard p[illegible] of 6s. 4d. per 100 only represents $\frac{1}{10}^{th}$ of the real value for the [illegible] trade seeing that what are considered as picked stems by this latter [illegible] at least 30 to 40 mms. in diameter (1 1/5 to 1 3/5 inches). This is [illegible] ional evidence in favour of the cultivation of this crop in uncultivated [illegible] whether of plain, hill or mountain.

440 – **Cost of Running a Peach Orchard in North Carolina, U. S. A.** — Page [illegible] W. *The Country Gentleman*, Vol. LXXX, No. 47, pp. 1750 and 1772. Philadelphia, N. [illegible] 1915.

The farmers of Moore County, North Carolina, have established an organisation, known as the Sandhill Board of Trade, the chief object of which is to ascertain exact facts and conditions, and profits and losses on all farms and crops in the territory. The carefully tabulated information gained by this society is of real and practical value to the whole community.

The present writer takes as an example the case of peach growing such as it appears from an examination of the books of the Carolina Fruit Company, a little ninety-acre orchard which may be regarded as typical. It was planted in 1907 on land cleared of scrub oak and pine stumps

ceipts and expenses of the Company, from its beginning until Sept. 1, when the first small crop of peaches was sold, were as follows:

No. 1. I. — *Statement for the Period Jan. 1, 1907 to Sept. 1, 1910*

Receipts: 1907 to September 1, 1910

Stock:	
Issued for cash	$12,000.00
Issued to promoter	1,250.00
	$13,250.00
Cotton grown on an acre in 1908	87.80
Cowpeas grown between trees	1,000.00
Corn sold	8.00
Interest in idle money invested	96.28
Hired open account	109.53
Peaches sold, 1910	1,961.20
	$16,512.81

Disbursements: 1907 to September 1, 1910

13 acres of wild land	$ 845.00
Building: 7-room house, 4-mule barn, shed and tenant house	1,314.00
1500 peach trees	881.85
Fence	661.15
Well	141.00
Total labor bill, including clearing land	1,900.31
Fertilizer for 3 1/2 years, including all crops	2,005.88
Seed, corn, cotton, peas, etc.	400.00
Pair mules and harness	288.45
Machinery, total	474.05
Feed for mules	76.10
Crates for peaches	2,046.85
Spraying material	423.00
Taxes	166.05
Legal expense, incorporating, etc.	150.00
Office expense, including auditor and travelling	310.10
Exchange on checks	.82
Freight on peaches	961.05
Salary paid superintendent	1,200.00
Insurance	70.00
General expense, small miscellaneous items	180.68
In superintendent's hands. Spent but not accounted for	299.10
Money loaned	32.22
Profit and loss	54.53
Promoter's bonus	1,250.00
	$16,705.89

TABLE II. – *Statement for the 4 years' working* 1911-1912-1[illegible]

		1911	1912	1913	
	INCOME.				
1911	Peaches	$4,979.52			
	Mortgage	2,028.99			
	Bills payable	1,090.00	$8,098.51		
1912	Peaches	—	$10,131.69		
1913	Peaches	—	—	$15,13[illegible]	
1914	Peaches	—	—	—	$[illegible]
	EXPENSES.				
	Mortgage and interest	$2,132.99	—	—	
	Taxes	17.24	$28.70	$42.01	$[illegible]
	Bills receivable	60.00	—	—	
	Interest, less discount	—	78.15	62.10	1[illegible]
	Legal fees	6.00	—	—	
	Fire insurance	—	41.93	—	
	Superintendent's salary	720.00	480.00	480.00	1[illegible]
	Freight, expressage, telegrams, and telephone service	105.00	284.59	11.50	[illegible]
	Crates	695.25	2,081.77	1,075.50	1[illegible]
	Labor	1,375.08	3,221.04	3,206.08	[illegible]
	Repairs, additional tools, etc.	478.81	387.11	147.01	
	Sundry supplies	165.34	138.57	56.93	[illegible]
	Fodder, grain, etc.	47.05	219.46	210.52	2[illegible]
	Superintendent, to account	97.48	—	—	[illegible]
	Charged proportion of cost of packing house	—	200.00	300.00	
	Fruit trees	—	87.07	53.03	
	Seeds	27.12	33.75	12.00	[illegible]
	Fertilizer	776.00	591.00	949.51	[illegible]
	Spraying material	160.11	225.11	289.32	2[illegible]
	Printing, stationery, postage, etc.	—	—	25.10	[illegible]
	Bookkeeper and auditor	224.50	—	80.00	2[illegible]
	Depreciation on buildings	131.00	—	—	1[illegible]
	Depreciation on machinery, etc.	—	—	—	1[illegible]
	Cash on hand	783.45	—	—	[illegible]
		$8,098.51	$8,098.85	$7,008.50	$[illegible]
	Balance, net profit on operations		2,332.84	8,122.30	1[illegible]
		$8,098.51	$10,431.69	$15,130.80	$[illegible]

III. — *Balance Sheet for 4 years' Working* 1911-1912-1913-1914.

		1911	1912	1913	1914
ASSETS.					
[illegible] trees			$11,800.00	$11,800.00	$13,530.00
[illegible]			2,124.13	1,721.13	1,738.50
[illegible] implements, etc.			770.00	850.10	1,024.60
[illegible]			750.00	55.00	1,050.00
[illegible] spraying material			150.00	50.00	75.00
[illegible] land			1,091.20	965.05	338.25
[illegible]			97.70	92.70	—
[illegible] due company,			1,573.10	—	24.50
[illegible] stock, 100 shares			—	—	1,000.00
[illegible] on hand			100.00	300.00	510.00
[illegible] on hand.			51.00	50.00	—
[illegible] clearing new land			—	—	193.00
[illegible] new water service.			—	—	220.04
		$15,800.00	$18,911.22	$16,488.05	$19,713.79
LIABILITIES.					
[illegible] stock		$13,870.00	$14,070.00	$14,070.00	$17,530.00
[illegible] payable		1,900.00	1,700.00	—	—
[illegible] accts payable		—	268.20	—	
[illegible] superintendent, balance		—	—	420.18	
[illegible] 1913		—	2,875.03	—	
Profit and loss account, 1913:					
Surplus 1912	$2,875.93				
Less superintendent's share of profit, $883.21, and sundry adjustments, $64.37	646.68				
	$2,229.25				
Profit 1913, $8,122.30 Superintendent's share $2,030.58.	6,091.72				
	$8,320.97				
Dividend 1913, 45%	6,331.50				
Surplus	$1,989.47		—	1,989.47	
Profit and loss account, 1914	1,989.47				
Balance, 1913, less half amount of stock issued to superintendent	1,737.00				
	252.47				
Sundry adjustments	33.17				
	$285.64				
Profit and dividend, treasury stock	250.00				
Profit, season 1914	4,277.05				
	$4,813.29				
Dividend, 1914, 15%	2,629.50				
	$2,183.79	—	—	—	2,183.79
		$15,800.00	$18,911.22	$16,488.05	$19,713.79

Success has been almost entirely due to the superintende... interest was obtainable only on the condition that he be given a ... in the orchard at the end of four year's work. As a result of the ... of this interest the capital stock of the Company has been inc... $17 530.

Out of the profits as shown in the accompanying balance s... company has also planted 25 acres of new trees, has built a bi... house costing $1 400, bought a new pair of mules, installed a wate... and added a larger spraying outfit.

411 - **The Practical Balance for a Successful Dairy Farm in the United States** WARREN, G. F., in *Hoard's Dairyman*, pp. 730, 731, 732. Fort Atkinson, Wisc., 1... In ordinary dairy-farming practice some of the most impor... tors for success are the size and diversity of the business, the cro... and the receipts per cow. Each of these problems involves many ... For example, good receipts per cow involve the quality of the cow, ... thod of feeding and management and the marketing of the produc... another factor of more general character and of specific importance ... organisation of every agricultural enterprise is that of the distribu... the work during the year in such a way as to make the very best ... the labour at the disposal of the farm. In agriculture, as in all othe... nual occupations, a full year's work is normally necessary to make ... fitable.

Enough facts about farming are now available to give us a know... of how much work it takes to make a full year. Cost accounts on ... farms show that the entire care of a dairy cow, except raising the fe... quires 140 to 150 hours per year. Sometimes the work is done in 100 ho...

Most successful farmers work about 2 500 to 3 000 hours in a ye... If this is called a year's work, it would require 20 to 25 cows to provi... full employment for one man. The writer has indeed actually visited ... eral farms where one man does milk and care for 25 cows, but obvio... such a plan is not practical. However, it is practical to have two men ... for this number of cows and spend half their time at other work.

In order to compare farms and thereby learn what factors contribu... to making a good profit, we must have some standard of comparison. Labo... income, or the wages that the farmer makes for himself is the be... means of comparison. To obtain the farmer's labour income all farm e... penses are subtracted from the farm receipts. The difference repres... the amount that the former and his money earned. Subtracting inte... on the capital at 5 per cent, we get the labour income.

If some member of the family other than the operator helps with ... farm work and does not receive wages, the amount that it would cost ... hire this work is called an expense.

The writer then proceeds briefly to examine the influence of th... chief factors: size of the farm, dairying combined with the crop produc... and the milk yield of each cow, on the labour income of the owner.

Size of farm. — In the case of 142 farms in the county of St. Lawre... New York, attention has been paid to the influence on the labour inco...

... the total number of cows and the milk production of each. In ... dairying is the only important industry; 80 per cent of the ... come from the sale of dairy cattle and milk.

... pastures are available, but not much good land is available for ... crops for sale. The only important crops are hay, maize for the ... oats. Practically all the grain feed for cows is purchased. Under ... conditions, it is evident that the number of cows kept is a good ... of the size of the business. The results for the 142 farms are set ... Table I.

TABLE I. — *Relation of Number of Cows to Labour Income in a Region Selling little but Dairy Products.*

... cows	Milk sold per cow		
	$ 72 or less	$ 73 – $ 88	Over $ 88
	Labour Income	Labour Income	Labour Income
... 20	$ 309	$ 487	$ 43
	397	780	1 142
	630	922	1 774

As will be seen from the table, the farmers who have less than a ... man farm, that is, less than 20 cows, are on the average not making ... than a hired man's wages. But those who have more cows are doing

Table II shows the relation of the size of farms to profits on 579 farms ... Livingston county, New York. This a grain growing, general farming ... dairy region.

TABLE II. — *Relation of Size of Farm to Labour Income in a Region that Combines Dairying with Cash Crops.*

Acres Farmed	No. of farms	Average area	Average tillable area	Labour income
...	17	20	17	$ 54
	35	44	37	205
	147	79	64	437
	178	127	104	594
	89	175	142	931
...	112	305	241	1 082

The results indicate that, on the average, in this region about 200 acres are required for a very successful farm. Of course, some farms are successful, but evidently they are working at a disadvantage. The larger farms are better equipped with horses and machinery and either of these costs so much per acre as on the small places. One man is sufficient for 20 to 30 acres of general farm crops. If one is to get the great saving in human labour that comes from driving three and four horse teams, he evidently needs 80 or more acres of crops to keep the horses busy. A mixed farm requires for other reasons another 100 acres for the horses, but in order to obviate over-working of the two labourers at certain seasons the number of cows should be reduced to between 10 and 15. In most dairy regions in the United States this means a 160 acre farm, with the remaining 80 acres being used for pasture, woods, roads and farmstead.

Several years ago, an agricultural journal made a study of farms rated by its subscribers. These farms averaged 167 acres and 85 acres of crops per farm besides pasture and woods. These farms had an average of 16 cows and 6 horses. They are much larger than the average farm and make labor incomes much larger than the average farmer makes.

In the irrigated zone of Logan, Utah, instead of two or three acres being required to pasture one cow, as is the usual average in dairy regions, the rich soil and abundance of water make it possible to pasture two or sometimes three cows on one acre. Alfalfa gives large yields per acre. Sugar beets are the important cash crop. Under these unusual conditions a farm of 50 acres may be as large a business as 160 acres is in some other regions.

TABLE III. — *Relation of Receipts per Cow and Cash Crops to Profits on 585 Farms with 6 or more Cows, Jefferson County New York*

Per cent. of receipts from Crops	Receipts per Cow from Milk and Its Products		
	$ 50 or less	$ 51 - $ 75	Over $ 75
	Labour income	Labour income	Labour income
No crops sold	$ 56	$ 572	$ 1,[illegible]
1–20	311	589	[illegible]
21–50	426	947	1,[illegible]
41–60	551	1,366	*
Over 60	509	*	**

* Only 2 farms in this group.
** No farms in this group.

Diversified and Specialised Dairy Farms. — Table III shows that farmers who derive at least a part of the income from the sale of cash

Type of work	January	February	March	April	May	June	July	August	September	October	November	December
Stable of 42 cows: 1 bull, 10 heifers	625	470	497	528	433	350	368	303	294	303	372	510
9 Horses	37	23	50	45	64	55	37	31	37	50	23	31
Manure	31	50	23	45	42	—	37	92	60	31	56	37
Potatoes 10.2	—	50	193	—	—	—	—	—	—	—	—	—
Potatoes 10.7 acres	—	—	—	45	225	170	101	18	—	221	—	—
Maize 10.2 acres	—	—	—	147	14	105	92	36	184	27	—	—
Oats 43.8 acres	—	—	—	110	110	—	24	276	—	266	—	—
Oats 19.4	—	—	—	—	—	—		—	—	—	73	—
Wheat 1.84	—	—	—	—	—	—	—	55	73	—	—	—
Hay 101.7 acres	—	—	—	294	—	—	778	—	—	—	—	—
Alfalfa 4.0 acres	—	—	—	—	18	55	—	—	—	—	—	—
Cabbage 0.7 acres	—	—	—	—	23	165	18	60	18	110	23	—
Poultry 188 head	14	14	9	9	9	9	9	9	9	9	9	14
Farm	14	—	—	18	110	193	92	138	221	55	—	—
Staff	14	70	175	56	14	66	83	—	—	—	—	23
Equipment	—	—	—	—	—	—	37	—	66	18	18	—

make much more than do those who sell nothing but dairy produc[e]. are many reasons why it pays to combine crops with dairy farm[ing]. reason is that two men can milk 15 to 20 cows and yet have ha[lf] for field work. This is more time available than is necessary t[o] feed for the cows. The horses kept on the farm also have time to [do] crops than feed.

Another reason why such crops help is that the manure is m[ore] effective when spread over more land than when it is all used o[n] that raises feed for the cows.

This point is well illustrated by a test continuing for 21 year[s] Ohio Experiment Station. When 4 tons of manure were applied [to] every 3 years, each ton of manure gave increased crops worth $ [4] ton. But when twice as much manure was applied on the same l[and] additional amount gave crops worth only $ 1.95 per ton of addi[tional] manure.

The dairyman is particularly fortunate if he can combine some priced crop with dairy farming. In some States, fruit, potatoes [or] or cabbages are very profitable crops to combine with dairying. I[rri]gated regions sugar beets are commonly grown on dairy farms. All intensive crops give a very large return for manure.

In the maize belt one of the most profitable systems of farming is combination of dairying and hog raising.

There are many reasons why at least some cattle should be kept. C use up products that would have little value on the market, such as [corn] stalks and low grade hay. Perhaps the point of most importance is they provide for a full day's and for a full year's work.

Table IV shows the annual distribution of man labour for a farm giving excellent profits.

The labour is supplied by 3 men occupied the whole year round [and] temporary outside help at harvest time. The dairy herd averages abo[ut] cows and 187 acres of crops are grown. The cash crops are the best for the region: potatoes, cabbage, timothy hay. The combination is a very efficient business.

Milk yield of individual cows. — The importance of good returns per cow is shown in Table V, which gives results for 585 farms in Jefferson County. They are divided into 5 classes according to the average yield per cow.

Similar figures have also been obtained from several other dairy regions.

The principal problem in the organisation of a dairy farm consists establishing a perfect balance between the 3 factors mentioned for a particular region. This being so, what is required is a careful examination of each of these factors in order to determine which of their amount is capable of modification in order to obtain the best results.

The method of procedure for this analysis is exemplified in Table VI

TABLE V. — *Relation of Receipts per Cow from Milk and its Products to Profits on 585 Farms with 6 or more Cows in Jefferson County, New York*

Receipts per cow	Average receipts per cow	Number of farms	Labour income
Less than $ 50	$ 22	45	$ 241
$ 50 to $ 75	62	148	393
$ 75 to $ 100	85	221	864
$ 100 to $ 125	86	111	969
$ 125 and over	111	60	1 [illegible]

TABLE VI. — *Relation of Various Factors to Profits.*

	Farm No. 1	Farm No. 2	Farm No. 3
Total acres	52	240	200
No. of crops	20	133	100
Number of cows	11	20	32
Sales per cow	$ 110	$ 95	$ [illegible]
Yields in relation to the average of locality	double	[illegible]	[illegible]
Percentage of receipts that come from crops	21%	16%	[illegible]%
Labour income	$ 980	$ 1061	$ 113 [illegible]

As seen above, N° 1 is a very well balanced farm but is too small. The weak points in N° 2 are the crop yields. A neighbour who had all the facilities almost exactly the same, except that he had good crops, made a labour income of $ 2239. In the case of Farm III the owner had nothing left to pay for his year's labour, yet he raised very much better crops than his neighbour, N° 2, and kept more cows. His weak spot is in the returns per cow. If these were as good as on Farm N° 2 this farmer should make at least $ 1500.

Profits and Loss in the Dairy Business of Chemung County, New York, United States. — CHUBBUCK M. E., in *American Agriculturist*, Vol. 96, No. 25, pp. 1, New York, December 18, 1915.

The Chemung County Farm Bureau has published the results of a careful research in order to ascertain the profits and loss in the dairy business of the County. The following points were determined:

a) The feed cost of cows on each farm;

b) The medium production per farm;

c) The relation between these two factors and the labor the farmer.

The results are summarised in the two following tables (which gives the average results for the whole County, and therefore ses hill and valley farms, while the second gives those of 115 v In each table the farms are divided into 5 groups according to t cash returns per cow.

TABLE I. — *Cost of feed per cow in Chemung County.*

Gross receipts for milk and butter per cow	Feed raised	Feed purchased	Total feed	Milk and butter receipts per cow	Profit above feed cost
$ 50 and less . . .	$ 38	$ 7	$ 45	$ 37	$— 8
$ 51 to $ 75 . . .	40	11	51	62	11
$ 76 to $ 100 . . .	41	10	(illegible)	87	27
Over $ 100	18	18	68	119	53

TABLE II. — *Receipts per cow, 115 valley farms.*

$ 50 and less	$ 42	$ 7	$ 49	$ 42	$— 7
$ 51 to $ 75	17	8	55	63	8
$ 76 to $ 100 . . .	53	15	68	87	19
$ 101 to $ 125 . . .	52	19	71	110	39
Over $ 125	53	23	76	140	64

(1) The farmer's labor income is obtained by subtracting from the gross profit the ses and the interest of capital at 5 %. The labor furnished by members of the farm figures in the expenses and is estimated according to the equivalent local labor rate the farm produce taken for home use constitutes, on the other hand, a further income besides the remuneration thus calculated for his personal labor and management

The five groups of farms, classified according to the average c turns per cow, show a series of clearly defined relations represented first place, by the progressive increase of the farmer's labor income portion to the progressive increase of the average returns per cow; increase of purchased feed in proportion to the increase of produc raised feed; by the increase in production of raised feed in proport the increase of total feed consumed, with a constantly progressive r to purchased feed, and a less constant one to feed raised on the farm may therefore be concluded that, though the labor income in the se groups of farms thus divided is the result of factors that may have indi

various ways, the first place among these factors must in practice ... to the average production of the cows. This production depends more upon the quality of the cows employed and upon the quantity of purchased feed they eat than upon the increase in price of the forage used and consumed on the farm. The great difference to be seen in the average produce of the cows in single farms, and in the farmer's labor ... is chiefly due to the fact that in County Chemung there exists a cow-testing association, numbering 20 members, which has considerably raised the production on the farms belonging to members by eliminating the less productive cows.

In 1914, the average production of 278 cows was 6880 pounds of milk and 258 pounds of butter fat showing an average test of 3.76 %.

AGRICULTURAL INDUSTRIES.

Methods of Testing Must. — MENSI CARLO, in *La Stazioni Sperimentali Agrarie Italiane*, Vol. XLIX, No. 1, pp. 35-38. Modena, 1916.

The writer gives a short account of the principles upon which the GUYOT & BABO mustimeters are based and shows the errors which may arise in their use.

With regard to the tests of grapes and musts based on their sugar content, especially if this latter is determined by means of mustimeters, the writer observes that no account is taken of non-saccharine extractives, such as acids, colouring matters etc. which are of considerable commercial and organoleptic importance, as it is these extractives which give the wine its distinctive character and distinguish it definitely from a simple alcoholic solution.

In the analysis of musts, it is considered that the BABO mustimeter should be abandoned and one of the two following methods adopted instead:

1) *Densimeters* giving the specific gravity of the musts to the 3rd or 4th of decimals. The specific gravity provides information of a more general type than that given by BABO's method; by the aid of the tables of WINDISCH (or of others which may eventually replace these latter) it enables the quantity of substances dissolved in the musts to be calculated.

2) *Saccharometers*, also based on the tables of WINDISCH, giving the total quantity of substances dissolved in the musts and if necessary their density also.

Further, the composition of musts should be studied by more up-to-date methods than those now in use.

Six analyses of musts from the 1914 vintages show the practical application of the principles laid down by the writer.

111 - **The Milling of Rice and Its Mechanical and Chemical Effect upon the Gra...**
. WISE, F. B. and BROOMWELL, A. W. (Office of Grain Standardisation an... Laboratory) in *U. S. Department of Agriculture, Bulletin* No. 330, pp. 1-2... ington, D. C., January 8, 1916.

These investigations concern two types of rice which comp... bulk of the rice crop grown in the United States, viz: Hondura... and slender; and Japan rice, smaller and nearly round in shap...

Mechanical effects of milling. — No figures are available sho... breakage of rice in mortar and pestle mills. It is believed, how... the breakage was small and that decline in use of these latter w... other economic factors, such as their comparatively small output...

The "plantation huller", a machine for cleaning rice for ... causes great breakage, especially to rice of the Honduras type. T... lowing table shows the effect of milling in the plantation huller o... duras rice.

Milling stage.	Grains per cent.				
	Whole.	Three quarters.	One half.	One third.	...
After first hulling	32.0	12.7	44.1	7.0	...
Finished product	9.6	8.8	38.8	24.8	...

The effect of modern rice milling machinery is shown in the f... ing figures for the mechanical analysis of 56 series of samples of H... ras rice and 25 samples of Japan rice collected from modern mills in L... siana, Texas and Arkansas.

Milling stage.	Honduras rice number of grains per cent.					Japan ... number of grains per ...			
	Whole.	Three fourths.	One half.	One third.	Less than one third.	Whole.	Three fourths.	One half.	...
Paddy machine	74.35	8.76	15.33	1.16	0.40	92.38	2.38	4.38	0.65
Hullers and pearling cone	52.51	13.38	24.73	5.67	3.71	84.22	4.30	7.66	2.11
Brush (polishing without tale etc.): in	49.96	13.56	25.51	6.54	4.43	80.37	4.89	8.54	3....
out	52.57	14.62	26.28	5.11	1.42	82.52	4.84	8.06	2....
Trumbles (for coating in the glucose state) . . .	51.69	14.44	27.18	5.49	1.20	82.57	4.70	8.29	...

The five stages in the milling process at which these samples were taken are considered very significant. The first rice is from the paddy machine and shows the condition of the grain after the removal of its hull between the stones and the separation of the remaining portion of rough rice. This, then, is brown rice retaining the bran coat and germ nearly intact. Naturally, the percentage of whole grains is comparatively large, but it is found that badly sun-cracked rice often shows a considerable amount of breakage even at this stage.

The next stage is concerned with the removal of the bran in the "hullers" and pearling cone. The severe scouring to which the grain is subjected is shown in marked decrease in the percentage of whole grains. It is at this stage that most of the breakage in rice milling occurs.

The brush is the polishing machine for the removal of the finer particles of bran. This causes a very slight reduction in the percentage of whole grains, which is recovered in the reeling process, by the removal of the smaller fractions, as brewer's rice.

The final stage concerns the rolling and heating after the application of coating of glucose and talc. A slight breakage also occurs here due to changes of temperature.

Corresponding to the decrease in the number of whole grains there is also a gradual decrease in the weight per 1000 grains during the milling process.

Chemical Effect. — The product from the "plantation huller" is lower in percentage of ash, ether extract and crude fibre than the rice from the old mortar-and pestle mills, indicating a more thorough scouring of the grains in the huller. The changes in percentage composition are still better in rice milled by modern machinery.

The ash content is reduced very markedly when the hulls are removed and one half of the ash which remains is removed by the scouring work of the hullers. During the remainder of the process the decrease is gradual. The total loss by the cleaning and polishing process (from paddy machine to trumbles) is 66 per cent or $^2/_3$ of the total ash of the hulled rice. The percentage of fat or ether extract is generally increased by the removal of the hulls unless the stones are not properly adjusted so that some of the germ becomes removed. More than 75 per cent of the fat content of the hulled grain is removed in the hullers and the total loss of fat from the finished rice is 85 per cent.

With regard to the crude fibre content, 88 per cent is removed with the hulls and 7.3 per cent of the remainder during the scouring processes.

Only 10 per cent of the protein content of the hulled grain is removed in the scouring, showing that the aleurone layer is not removed.

Approximately 60 per cent of the pentosans is removed with the hulls and 32 per cent of the remainder during the scouring process.

These changes in chemical composition are much the same in both Japan and Honduras rice.

Commercial products. — Milled rice is graded according to the percentage of whole grains and the size of the particles. Thus Honduras

rice is marketed in four grades: 1) *Fancy head* or "*Head*" rice . . about 80 per cent of whole grain and yielding about 50 lbs per . . . rough rice; 2. *Second head*, consisting of broken grains yielding 1 . . barrel; 3) *screenings*; and 4) *brewer's rice* yielding respec . and 8 lbs.

Effect of Milling on the Chemical Composition of Rice

Milling stage	Moisture	Ash	Ether extract	Crude fibre	Pr ie .
	per cent	per cent	per cent	per cent	per ce .
Honduras Rice:					
Rough Rice	11.27	5.40	1.58	8.67	7.48 .
Rice from paddy machine. . .	12.32	1.18	1.79	0.99	8.1
huller-	12.56	0.53	0.40	0.39	7.7 .
pearling cone . .	12.50	0.47	0.28	0.30	7.88
brush	11.89	0.30	0.25	0.30	8.06
trumble	12.02	0.40	0.21	0.26	7.75
Total loss in dry matter. . .	—	60.00	85.00	73.00	10.00
Japan Rice:					
Rough rice	11.05	5.14	1.74	7.93	6.50 .
Rice from paddy machine. . .	12.38	1.13	1.52	0.85	7.24 .
huller-	13.70	9.70	0.60	0.42	6.82
pearling cone . .	13.38	0.40	0.31	0.29	6.50
brush	12.82	0.32	0.22	0.29	6.61
trumble	12.50	0.34	0.19	0.29	6.47
Total loss in dry matter. . .	—	70.00	87.00	66.00	12.00

Japan rice is marketed in 3 grades as follows: 1) *Fancy head* or "*Head*" containing 90 per cent of whole grains and yielding 96 lbs. per barrel of rough rice; 2) *screenings* and 3) *brewer's rice* each yielding 5 lbs. per barrel.

The mill yield of rice hulls approximates 30 lbs., that of rice bran 20 lbs. and that of rice polishings 6 lbs per barrel of rough rice.

Chemical analyses of the various commercial grades of rice show a slightly smaller percentage of ash, ether extract, and crude fibre in the higher than in the lower or more broken grades. The percentage of protein in the milled Honduras rice is somewhat higher than in the Japan rice.

Rice hulls contain but little ether extract or protein, but are very

...ude fibre and pentosans. Bran and polishings are rich in fat ... and when fresh and not adulterated with hulls are considered ... stock feed.

The Utilisation of the Residues of Oil Extraction from Olives. CHEVALIER H. ... *Les Huiles. Bulletin de la Direction ... de France*, 9th Year, No. 85, pp. 27–283. Tunis, November–December 1913.

... result of his research among the writings of such Latin writers ... Varro etc. the writer has been able to identify the *margines* or ... of French olive growers with the *amurca* of these ancients. Contrasting modern practice which usually disregards this by-product these ... advised its preservation and utilisation.

In order to preserve the *amurca* it is boiled on leaving the press, until ... is reduced by one half, it is then put into vessels in the same way ... and wine. The Latin agronomists were unanimous in recommending ... as a *fertiliser* and as an *insecticide*. CATO recommended watering ... of olives and sterile fig trees with *amurca* diluted in water. COLUMELLA and PALLADIUS gave similar advice, the latter recommending ... the "cooked" state for treating the roots of vines. For the control ... animal parasites of this latter plant and especially of *Pyralis*, CATO ... mends the following method for its employment: after allowing *amurca* to settle, concentrate to the consistence of honey, add $\frac{1}{3}$ of ... ered bitumen and $\frac{1}{4}$ of flowers of sulphur, and finally concentrate ... whole to the consistency of glue. The product is then spread on the ... and branches. The same author also recommended the use of ... for sheep scab, ants, weevils and parasitic mites, and spoke of its ... ties as a preservative of skins, leather, wood, metal etc.

The neglect of this residue of the oil press by modern practice consti... a considerable loss to agriculture. The olive may be regarded as ... ing, by weight: $\frac{1}{3}$ of oil (maximum) and $\frac{1}{3}$ of cake; the remaining $\frac{1}{3}$ ... therefore be regarded as the quantity of "margines". The quantity ... product wasted yearly in France may be calculated as 80 000 metric ... tons. The following analysis by M. BERTAINCHAND will serve as a basis ... the estimation of lost fertilising matters:

1 litre of "margines", density 1150-1150 contains in grms.:

... matter	21.20	Phosphoric acid	0.39
...	12.43	Chlorine	2.52
...	0.50	Nitrogenous matter	3.98
...	0.78		

The annual loss would thus amount to:

	metric tons		metric tons
Mineral matter	19 300	Lime	600
Potash	9 800	Phosphoric acid	300
Nitrogenous matter	3 200		

The whole of the above should be returned to the soil. [illegible] should not be great provided the " margines " are used in the [illegible] as in Liguria and as advised by a number of writers (1).

The writer draws attention to the fact that COUPUT and [illegible] have recommended the use of the " margines " as a fertiliser [illegible] their trial as insecticide, either in powder or wash form, against [illegible] sects for instance.

11° **A New Yeast Preparation for Use in the Estimation of Crystallizable Sug Inversion.** — PELLET, H. in *Procès-Verbaux de l'Association des Chimistes de Distillerie*, Vol. XXXIII, Bulletin No. 1-3, pp. 12-13. Paris, September [illegible].

The above is an account of the different methods which have proposed and applied for the estimation of crystallizable sugar by [illegible] inversion by the aid of yeast or of its extracts with remarks on their tages and drawbacks. A description is also given of a new method rapid preparation of a highly active yeast which is devoid of disad and is capable of conserving its properties for a long period.

It has been observed that on adding to the sugar solution [illegible] of salicylate of soda per 3 grms. of baker's yeast, liquefaction of the is practically instantaneous. This syrup of yeast or of invertase is of retaining its qualities for a long period. When required for use only necessary to dilute 30 grms. in 100 cc. in order to obtain a ye quor which also keeps for a long period. For purposes of inversion are added to 50 cc. of the specially prepared sugar solution to be (neutral) and free from lead). The mixture is heated in the wat for half an hour at 55° C., allowed to cool, made up to 100 cc. in volum shaken. In the case of solutions of molasses addition is made of [illegible] of animal charcoal used for decolorising wines. The mixture is sh filtered and a small quantity of dry tripoli added, the whole shaken a tered afresh, care being taken to protect the filter and glass from ev tion. Polarisation is effected with the 200 or preferably with the [illegible] and the crystallisable sugar estimated by means of the ordinary for with the substitution, however, for the constant 144 (CLERGET) or [illegible] (German formula and method) of the constant 141.8 or 141.9 [illegible].

The writer intends to return to the study of this constant and dicate the exact method for its determination in each case.

The advantage of the yeast with addition of salicylate of soda is it is easy to prepare and large quantities may be prepared at a time necessity for preparing more or less pure solutions of invertine is avoided.

This decoction of invertine when added to the sugar solution is very active, the operation being completed after half an hour's hea at 55° C., instead of 4 or 5 hours.

Further, there is no cold alcoholic fermentation and the liquid not require heating before the addition of the yeast.

(1) See *B.* December 1915, No. 1250

This method is capable of being applied to all the yeasts known. All is required to be known is that the quantity of yeast added (3 grms. per 50 cc. of sugar solution) is sufficient to invert an amount equal grms. of crystallizable sugar in half an hour at 55° C., as in the case English yeast (a brewer's yeast of high fermenting capacity), in the KARCHER yeast (low fermentation) and in that of the Parisian ba

The results obtained are very uniform and it is only necessary to use care in the preparation of the neutral solutions.

It is intended to treat of this latter process in a paper on the analysis products of the sugar industry by means of invertine.

Cold Extraction of Cream of Tartar from Grape Marcs by Cambiaggi's Method.

CAMBIAGGI, in *Giornale Vinicolo Italiano*, 42nd Year, No. 7, pp. 121-124. Casale Monferrato, February 15, 1916.

The CAMBIAGGI method for the extraction of cream of tartar from marcs is based upon cold treatment with commercial soda. The of tartar, which is almost insoluble in pure water, readily dissolves ater containing soda, forming a double tartrate of sodium and potas- The soda solution is passed through the mass of grape marcs from upwards and on emerging at the top, is reconducted in a similar through 4 other recipients. On leaving the 3rd recipient, the ous liquor is treated with hydrochloric acid and the acid potassium te precipitated in the form of crystals. The mother liquors remaining ated with lime and a new deposit obtained of calcium tartrate. The marcs are mechanically treated in order to integrate and compress in a manner which will allow of a uniform washing through every of each layer. The recipients are square in section, each side 2 1/2 in length and communicate with each other by means of holes 30 in diameter opening in the partitions. At their slow rate of progress liquors take 1 day to exhaust the contents of a recipient.

The process is completed by the scientific utilisation of the residue. Grape stones are extracted and being rich in oil and devoid of tannin an excellent cattle feed. The skins, separated from the stalks and by means of the "hydro-extractor", dried and mixed with differ- substances, form a food already appreciated in the trade under the of *enotarine*. MARCHI'S experiments have shown that the small tity of tartar remaining in the marcs is not only harmless to live stock even stimulates milk flow in dairy cows. One of the chief advantages AMBIAGGI's method is that it gives a pure cream of tartar and not a mixture.

Colour Changes due to Micro-organisms in the Distillates of Plants and Flowers.

GUYOT RENÉ, in *Journal de Pharmacie et de Chimie*, 10th Year, 7th Series, Vol. XIII, No. 2, pp. 37-46. Paris, January 1916.

The distillates of plants and flowers, particularly those of orange flo- are subject to deterioration correlated with the development of micro- isms: they become turbid, viscous or thin; their odour and flavour are attenuated; their colour turns to yellow, green or violet.

The deterioration in orange flower water (which it is custo... in open recipients) has been attributed by BARNOUVIN to the ... fungi, algae and bacteria.

The writer has recorded in a sample which he examined, ... of a species of Mucorinae, *Hyeroeroeis hydrodoroum* in the fo... flakes but has shown that the colouration is not due to this or... gas were absent. Whereas a drop of green orange flower wate... ded to the healthy liquid, communicated to the latter the powe... green, the former, when sterilised, no longer had this effect. ... subsequently isolated a bacillus the description of which is as fo... elongate, length 4 to 5 μ, breadth 0.5 μ, grouped in masses, li... tine, aerobic, non-chromogenic. A slight variation in the comp... the nutritive substratum is sufficient to cause the secretion ... matter on the part of the bacillus; there are thus certain fa... favour colouration.

These factors are: 1) oxygen and oxydisers (reducing age... other hand, attenuate or bleach the cultures); 2) light, especi... and ultra-violet rays (distilled essences should therefore be kept ... and not in blue flasks as is too often done).

On the other hand, the formation of pigment is hindered by ... ties and by certain metals (especially zinc); it is therefore advisable ... all consignments of orange flower water in zinc flasks. An a... favours Mucorinae; a neutral or alkaline medium is favourable to ...

The chromogenic principle appears to be a leucobase which ... under the action of acids and green under that of alkalis. While ... tion of Mucorinae attenuates the perfume of the distillates of flow... deterioration of the colour often renders it more delicate.

This deterioration is not exclusive to orange flower water but ... like an epidemic through the majority of the distillates (lettuce, ... nanon, melissa). On the other hand, cherry laurel water offers a ... strong resistance, even after inoculation: the contained hydrocya... acting as an antiseptic.

As a remedy, all the recipients through which the perfumes h... pass or in which they are to be kept should be washed by means of ... steam under pressure or else of acidulated water.

4470 – **Pasteurization of Milk in Modern Practice.** – AYERS S. HENRY, in *Le... partment of Agriculture, Bulletin* No. 341, 16 pp. Washington, D. C., Jan. 8, 1...

The writer gives a rapid review of the principal results of rece... periments on the pasteurization of milk. According to the results of ... experiments, the pasteurization of milk appears to be the best means ... ered so far of destroying, or at least rendering harmless, such pathog... organisms as: *Bacillus tuberculosis*, *B. typhi*, *B. diphtheriae*, the dysen... bacillus, and, according to the results of still later experiments, the ... agents of foot and mouth disease, scarlet fever and septic sore th...

The sterilization of milk by electricity and by ultra-violet ray...

...tisfactory for the destruction of bacteria, has not proved to be of ... a commercial process. (1).

...ring the last ten years there has been a rapid increase in the quantity ... pasteurized, particularly in the larger cities. Milk investigations ... the United States, show that in 7 cities out of 6 with a population ... than 500,000 each, more than 50 per cent of the milk is pasteu... ...t of 341 cities with over 10,000 inhabitants 51 have more than 50 ... of their milk supply pasteurized, 110 have 11 to 50 per cent and ... 1 to 10 per cent pasteurized. In the remaining 131 cities the milk ... was not pasteurized. The general tendency is towards the pas... ...tion of all market milk.

At present, there are three processes of pasteurizing practised in the ... States. The first is known as the flash, or continuous process, ... consists in heating rapidly to the pasteurizing temperature, then cool... ...ickly. In this process the milk is heated from 30 seconds to 1 min... ...dly, usually at a temperature of 160° F. or above. The second is ...holder or holding process; this consists in heating the milk rapidly ... temperatures of from 140° to 150° F. and holding it for approximately ... minutes, after which it is rapidly cooled. The third process is known ... pasteurizing in the bottle. The raw milk is put into bottles with water ...-fit seal caps, or devices which fit over the tops and necks of the bottles, ...esting the ordinary paper caps from the water, then immersing them ...ot water until heated to 145° F. and holding them at that temperature ... or 30 minutes. The cooling is accomplished by gradually lowering ... temperature of the water until that of the milk reaches 50° F. The ...ter has also tried with good results another method of pasteurization, ...ather, a modification of the holder process, which consists in bottling ... pasteurized milk at 145° F. in hot bottles which have been steamed for ... minutes immediately before filling. The bottles are then capped with ...dective caps, and cooled by spraying or by forced cold air circulation (2).

The process of pasteurization is frequently performed improperly. Re...ts obtained in 1912 from 231 milk plants showed that 91 per cent of ... which used the holder process pasteurized at the proper tempera... ...re. Among those which used the flash process only 57 per cent employed ...peratures high enough to give satisfactory results. The pasteuriza... ...on of milk by the holder process usually destroys about 99 per cent of ... bacteria, but often the milk is re-infected during the cooling or filling ... the bottles. In order to obtain a supply of sanitary milk in the cities a ...ct supervision of the milk plants is necessary, both as regards the cleanliness of the localities, the health of the cows, etc. In the control of pasteur...tion it is essential that the proper temperature be used and that the pro... ...be so performed that no re-infection takes place. This can best be ...complished by trained men who have authority to carry on such super...vision, and by bacteriological control of the process. Bottles should be

(1) *Sci. Am.* Jan. 1912, N. 1-60.
(2) " Oct. 1-15, N. 1055.

marked " Pasteurized " and show the date and the temperature at which the milk was treated.

The number and kind of bacteria that survive pasteurization depend entirely on the temperature to which the milk is heated. Experiments made by the writer have shown that with pasteurization at a temperature of 145° F., the acid group of bacteria remains more numerous than the alkali and peptonizing groups ; and moreover, that certain classes of streptococci and part of the colon bacilli contained in the milk may also survive that temperature. (1). One of the reasons of the objection to pasteurization is that it destroys the acid-coagulating bacteria and leaves the peptonizing bacteria living, but this reason is based on the results of high temperature pasteurization and is not applicable to the holder process as generally practised in the United States.

Pasteurization by the holder process is in all cases superior to the flash process. From a bacteriological standpoint, pasteurization at 145° F. gives assurance, so far as we know, of a complete destruction of disease producing bacteria and at the same time leaves in the pasteurized milk the maximum percentage of the bacteria that cause milk to sour (lactic acid bacteria) and only a small percentage of those that cause it to rot (peptonizers), the milk thus remains sweet for a longer period. From a chemical standpoint the advantage of low temperatures lies in the fact that milk pasteurized at 145° F., for 30 minutes, does not undergo any appreciable chemical change such as would affect its nutritive value or digestibility. It is now known to have little effect on the beneficial enzymes in milk and that the soluble phopshates of lime and magnesia do not become insoluble. (2). Pasteurization does not therefore injure the digestive or nutritive value of the milk even for feeding babies. According to the experiments made in this line by WELD, the slight difference was in favour of pasteurized milk. Finally, from an economic standpoint the cost of pasteurization is much smaller for the holder than for the flash process, the latter requiring 17 per cent more heat than the former.

From a series of tests in five establishments considered as representative of the average city milk plant, BOWEN found that the average cost of pasteurizing 1 gallon of milk is little more than three-tenths of a cent $ 0,0031 (3). This includes all the expenses necessary for heating and cooling the milk, coal, cooling water, labor, interest on invested capital and repair-

450 - **Advantages of Using Milk of Low Bacterial Content in Studying the Phenomena of Lactic Fermentation.** — BURRI, R. and HOHL G., in *Schweizerisches Zentralblatt für Milchwirtschaft*, Year 5, No. 2, pp. 12-14; No 3, pp. 19-23. Brougg, January 20, February 1916.

The object of the writers is to increase our knowledge of the principles underlying the lactic fermentation test. Experiments are in progress at the Dairying and Bacteriological Institute of Berne-Liebefeld and

(1) See *B.* July 1913, No. 804; *B.* Dec 1914, No. 1173; *B.* June 1915, No. 643.
(2) „ June 1913, No. 863.
(3) „ March 1915, No. 310.

... will be published at intervals under the title of "Contributions to ... knowledge of the scientific principles underlying the lactic fermenta... test." The present abstract is from the 1st portion of the series.

The researches of a large number of scientists, those of the present ... included, have shown that of the total number of bacteria contain... the milk immediately after drawing, $\frac{1}{10}$th are derived from the ... of the udder. Opinion is divided as to the properties of these bac... by some they are considered to be harmless and without any effect ... never on the quality of the milk and its derivatives, while others hold ... exactly opposite opinion. The present writer obtained from 4 cows, ... means of aseptic milking, milk samples with very low bacterial content: ... average of 200-300 per 1 cc. The enumeration of the bacteria was ... out on cultures prepared by 3 different methods; the numbers ... in complete agreement notwithstanding the fact that the experi... extended over 3 different periods, each of several days duration. The ... of bacteria were found to vary from cow to cow, even when the ani... were side by side in the same stable. Further, the species were al... constant for the same cow. Consequently, it may be safely concluded ... these bacteria are derived from the interior of the udder and not from ... al sources.

The species found were: *Bacterium Güntheri* liquefactive in the milk of ...; white liquefying micrococci for the milk of the 3rd cow and li... ...ing micrococci and streptococci in the milk of the 4th. The fermen... test applied to these samples has shown that the liquefying *Bacte... Güntheri* is the chief factor exerting an unfavourable influence on the ...mena of lactic fermentation. This organism causes the formation ...rd whose degree of consistency is intermediate between that of ca... and that of whey-curd.

It also produces a large amount of serum possessing a bitter flavour. ...e milk sample containing almost exclusively liquefying white micro... the curd formed was somewhat cheese like and in that containing ...ococci in addition to the white micrococci, the consistency of the ...ather resembled that of whey-curd.

If these results are not sufficient in themselves to explain the whole ...e unfavourable phenomena observed in the lactic fermentation test ...k obtained from these same cows, at any rate they show that the bac... of the udder are not always inoffensive and may possibly have injur... effects on the quality of the milk and its derivatives. The fact that ...ently healthy cows may harbour, in the udder, during a period of ...al weeks, practically pure cultures of suspicious bacteria (*Bacterium ...ori* liquefying" and streptococci) merits attention. In future, when ...ring into the defects of milk and in attempting to explain special ...arising in the utilisation of milk, it will be advisable to make use of ...e samples of milk containing only bacteria from the udder.

151 - **Milk Quality as Determined by Modern Dairy Score Cards.** — [illegible]
New York Agricultural Experiment Station Bulletin, No. 398, pp. 105-[illegible], March 1915.

Dairy score cards were originally designed to instruct th[illegible] and to serve as a convenient record of sanitary conditions. Th[illegible] led to a common belief that there is a relation between the score[illegible] and the quality of the milk produced by it. In order to pr[illegible] this belief had any foundation, the writer has made a comparati[illegible] the bacterial content of the milk and the scores of 34 comme[illegible] made on three representative cards; the first card is the Offici[illegible] of the Official Dairy Instructors' Association, now adopted for [illegible] State by the State Board of Health; the second is the one in use [illegible] York City Board of Health; and the third the one then in use by [illegible] Department of the Agricultural College at Cornell University.

In order to obtain accurate results, the writer himself made investigation of the three systems, making himself personally fam[illegible] each card and the manner of its application.

The samples of night milk and morning milk from each [illegible] be examined, were taken daily directly from the can as it was pl[illegible] the milk station platform, taken at once to the laboratory and [illegible] lactose agar. The results of the comparison between the bacte[illegible] of the milk and the dairy scores of 34 farms are given by the write[illegible] eral tables and a diagram.

These results prove that no correlation whatever exists betw[illegible] number of bacteria contained in the milk and the scores expressed [illegible] cards. Dairies with high scores produced milk with relatively high [illegible] counts, while the best quality of milk from a bacterial point of v[illegible] produced in low-scoring barns. On the other hand, the scores ob[illegible] by the three cards when applied to the same conditions generally [illegible] in the case of the three best dairies, while for the other 31 dairies there [illegible] instances of wide variations, so much so that dairies which should [illegible] been scored as "good" and even "excellent" according to one sy[illegible] would by another system be absolutely excluded. None of the 31 [illegible] under consideration scored below the exclusion point on either the [illegible] or Official card, while 15 dairies scored below this point on the New Y[illegible] City card.

The writer believes that the reason for which no correlation [illegible] between bacteria counts and the scores obtained by these three sy[illegible] lies in the fact that a large number of the items included on the sc[illegible] have little or no effect upon the number of bacteria present in the [illegible] while too little emphasis is placed upon the factors which actually af[illegible] the milk. The results secured in this investigation show that [illegible] score cards cannot be satisfactorily used as a means of grading milk a[illegible] ing to quality. There is little hope of designing a score card which [illegible] accomplish this purpose until all the factors which are thought to [illegible] the quality of the milk in any way have been carefully studied [illegible] influence of each determined and accurately measured. In this [illegible]

important factors can be singled out and given the proper values on the score card, thus strongly influencing the improvement in quality and the conditions of the milk supply.

The Detection of Added Water in Milk in India. LEONARD WALKER. *Imperial Research Institute, Pusa, Bulletin No. 87.* pp. Calcutta, 1917.

The detection of added water in milk depends in Europe usually on the percentage of "solids not fat", which, according to English law, should not be less than 8.5 per cent. This method cannot, however, be applied in India where the milk sold in towns consists of cows' and buffaloes' milk mixed. The percentage of solids-not fat in these is not identical, that of buffaloes' milk being generally greater because of the higher percentage of proteids it contains. The mean percentage of 150 samples of milk taken from 48 buffaloes and as many cows was 9.8; the probable error being ±.14. The buffalo milk vendor can thus add from 10 to 20 per cent water without fear of detection.

The method adopted was that of detecting added water by the freezing point of the milk, which, according to the Queensland Government standard, should not be higher than −0.55° C.

During the last two years, opportunities have been taken of ascertaining the freezing point of genuine milks at Government dairies in India, most of the samples being those of single cows or buffaloes. The amount of proteids contained in the milk affects the freezing point only in a minor degree, so that the freezing point of the two kinds of milk would be presumably about the same. The writer gives a table with the freezing points of 77 samples of cows' and buffaloes' milk tested in five different parts of India. The individual variations are considerable, but the samples have been mostly those of single animals, whereas the milk sold in towns is the mixed milk of a number, in which the variation is naturally less. The mean freezing point of all these 77 samples was −0.512° C., and the probable error ±0.00907.

The effect on the freezing point of adding water to milk is substantially linear and may be expressed by the equation $W = aX$, where W = added water expressed in a percentage of the sample, X = F.P of pure milk minus that of the sample (t), a = a constant. The writer has estimated the value of a in the equation from the freezing points of a series of portions of the same milk to which different (known) quantities of water had been added, the series of these tests yielded $a = 172$. As WINTER's table gives $t = -.176$, the writer holds the difference between the two to be immaterial and that $= 174$ may safely be taken as a good value. The equation then becomes $W = 174\,(-0.512 - t)$ where t is the freezing point of the sample. Judging by the probable error which accompanies the mean value = 0.542° C., a freezing point of −0.507° C., is possible once in a hundred times in the case of the milk of a *single* cow or buffalo; such a case would indicate 6.1 % added water. Such a case is not to be expected from mixed milks. Considering that the dairyman who waters his milk will not add so little as 5 per cent, it is quite certain that adulteration with

water can be detected by the chemist with certainty by the method based on the freezing point.

The writer, after some technical remarks on the manner of determining the freezing point, gives a table of the percentage of added water corresponding to the freezing point of the sample, ranging from — 0.5° C. to — 0.247° C.

151 - **The Chromogenic Micro organisms of Cheese and their Presence in the "Robbiola".** — DALLA TORRE GIULIO, in *La Stazioni Sperimentali Agrarie* Vol. XLIX, No. 1, pp. 59-67. Modena, 1916. Italian

The writer first gives a list of the principal chromogenic micro-organisms occurring in cheese, with notes on their action, and subsequently the results of a bacteriological analysis of a sample of "robbiola" cheese. The interior of the cheese was slightly spongy and the exterior covered by a thin yellow layer which enveloped the entire surface like a veil.

Two pieces were taken for analysis, one from the interior of the cheese in order to discover the micro-organism responsible for the sponginess and another from the outside in order to find the species producing the yellow colour.

In the first case, the action was due to a bacterium of the group *Lactogenes-coli* (the writer uses this nomenclature in preference to the usual name of the group *Coli-aerogenes* in order to indicate that this micro-organism is nearer to *B. aerogenes* than to *B. coli*). Of the 13 million bacteria contained in 1 grm. of cheese, 200,000 belonged to the above named group. The remainder was made up chiefly of *B. lactis acidi*.

The principal characters of the micro-organism producing the yellow colouring matter are as follows :

Micrococcus 0.8 to 1 μ in diameter.

Produces a yellow or yellowish green substance.

Necessarily aerobic.

Coagulates the milk and dissolves the coagulate, giving an acid reaction.

If cultivated several times in succession it loses its colouring properties and also its odour.

A comparison with the numerous bacteria producing a yellow substance described by various authors (often very similar to one another) shows no resemblance to any of these latter. Certain of its properties would place it at some little distance from *Micr. chromoflavus* (Huss), but it differs from this species in the following points : 1) by its behaviour towards milk and potatoes ; 2) by its odour ; 3) by its colour, which tends towards a yellowish green whereas that of *Micr. chromoflavus* is yellow chrome ; 4) by the colour produced at the surface of the cheese : yellow or yellowish green whereas *Micr. chromoflavus* gives a yellowish or reddish brown.

The micrococcus in question must therefore be regarded as a distinct species.

Fermented Milks (1). — ROGERS L. A., in *United States Department of Agriculture, Bureau of Animal Industry*, Bulletin No. 319, 31 pp. Washington, January 10, 1916.

The writer gives a brief resumé of our present knowledge of the subject as it is treated in numerous both popular and scientific publications, of these 82 of the most interesting and important are mentioned in the bibliography.

The use of fermented milks as a therapeutic agent is based on the assumption that they are able to combat the so-called auto-intoxication caused by the undue accumulation in the body, of toxic substances emanating from the intestinal tract. The lactic acid bacteria introduced into the digestive canal with the fermented milk would there multiply and replace the injurious bacteria which, being in unfavourable conditions, would be driven out. A particular bacterium now universally known as *Bacillus bulgaricus* is supposed to be especially active in suppressing the putrefactive bacteria, because of its vigorous development and characteristic ability to form acid in exceptionally large amounts from sugars, particularly milk sugar. COHENDY, BITTONOVSKY, and HERTER have found that *Bacillus bulgaricus* introduced into the intestine with curdled milk is readily established there, persisting for a considerable time after the subject has ceased to take fermented milk. RAHE concludes from his experiments that this bacillus persists in the intestine for only a few days after the ingestion of culture ceases, and in a recently published paper, he maintains that the difference between *B. bulgaricus* and certain acid forming bacteria which occur normally in the intestines, is so slight, that they can be distinguished only with difficulty, and he suggests that belief on the part of some investigators that *B. bulgaricus* becomes established in the intestines was caused by their inability to distinguish the two types. It is undoubtedly true that in many cases marked improvement has resulted from the ingestion of milk cultures made from *B. bulgaricus*, but it is by no means certain that the results which have been obtained by the use of milk cultures have been attributable to any peculiar virtue in the organism itself, or that the intestinal flora may have been radically changed by a fundamental change in the diet. In fact, DISTASO and SCHELLER, HERTER, KENDALL and REITGER have found that the nature of the bacterial flora of the intestines could be promptly and distinctly changed by a radical change from a diet high in protein to one in which carbohydrates predominated or vice versa. The conclusion seems obvious. The bacteria of the high-acid type, which are apparently normally present in the intestines, are stimulated by the unusual amount of milk sugar furnished by the milk diet, and multiply to such an extent that the ordinary mixed flora is suppressed.

Although the fat is partially or entirely removed in fermented milks, their food value differs little from that of the fresh milk from which it is made. Any increased digestibility of the fermented milk is due, not so

(1) See *B.* July 1911 No. 2215; *B.* Feb. 1912 No. 562; *B.* June 1912 No. 1664; *B.* Aug. 1912 No. 2140; *B.* March 1913 No. 301; *B.* Sept. 1913 No. 1086; *B.* Oct. 1915, No. 1080. (*Ed.*).

much to change in the chemical nature, as to the fact that the ... furnished in a precipitated and finely divided condition. In n... fermented milks is there any material cleavage of the casein r... the digestion in the stomach. The fat is practically unchang... part only of the sugar is converted into acid, alcohol, or carbon... the last is believed to aid in the digestion of certain fermented m...

In large cities several kinds of fermented milk are offered on th... such as buttermilk, sometimes koumiss and kefir, but more often ... In addition to these freshly prepared preparations, several tablet... sules purporting to be pure and active cultures of the *Bacillus ...* are now offered for sale, to use for fermenting the milk. But the... when prepared with care, lose their efficiency very quickly, *B. ...* being apparently particularly sensitive to dessication; it is there... visable that manufacturers should place the date of manufacture o... package and state the time within which the tablets should be us...

Buttermilk is the by-product resulting when milk or cream is ... for butter. If cream is churned sour, the acidity is sufficient to co... the casein which in the churning process is broken up into very fine ... cles. These settle very slowly, and if the buttermilk is agitated oc... ally it will retain its milky appearance. When the cream is allow... sour spontaneously, many bacteria other than the true lactic ba... will take part in the acid formation, and in addition to lactic acid th... termilk may contain in small quantities acetic, succinic, and formic ... and sometimes traces of alcohol. To assist and control to some ex... the acid fermentation of cream, certain prepared cultures, or starters ... be used which contain selected lactic-acid bacteria. Buttermilk, th... is the water of the milk holding the sugar, acids, ash and other soluble co... stituents in solution and the finely divided particles of precipitated ca... in suspension.

Chemically, buttermilk differs but little from skim milk. Only a ... re-arrangement is necessary to bring about the physical change in the ... sein to obtain a perfect substitute for buttermilk. At the present ti... a large part of the so-called "buttermilk" sold in cities, and also the pr... duct sold under the name of "ripened milk" is simply soured skim ... milk which has been churned or stirred in order to break up the curd. T... writer gives directions for preparing this buttermilk both for market pur... poses and home use. The principal point is to secure a culture, or start... which is merely milk containing the lactic acid bacteria free from oth... kinds. This may be obtained by allowing the milk to sour spontaneously ... of by good artificial preparations. A more nearly uniform product is ... cured if the milk is pasteurized. The scorched taste which results fr... pasteurization at a high temperature is obscured by the acidity of ... soured milk. After adding the starter, the temperature should be m... tained between 21° and 24° C. (70° and 75° F.). As soon as a fine curd has be... formed the milk should be cooled promptly to below 10° C. (50° F.) to pr... vent the contraction and toughening of the curd. A very refreshing a... nutritious drink is obtained by adding sugar and lemon to buttermilk

... is made from the milk of sheep, goats or cows in the Caucasus ... and neighbouring regions. It differs from most of the fer... milks in that it is made from a dried preparation and contains ... quantities of alcohol and gas. Small, yellowish, convoluted ... observed in kefir which are called seeds or "grains". The ... is made up of a mass of bacterial threads. In the outer ... cells are found mingled with bacteria. These grains when dried ... are said to retain their vitality for several years. When they ... to the milk they swell and increase in size by forming new grains. ... DENREICH describes four organisms that he isolated from kefir. ... A yeast which he designates *Saccharomyces Kefir* ferments ... and cane sugar, but not lactose. Two of the organisms were of ... acid bacteria type, but differed from them in forming gas in lac... media. Another organism, to which he gives the name of *Bacillus* ... resembles *B. bulgaricus* but differs from it by forming gas from ... and in being feebly motile. According to FREUDENREICH, the ac... these four organisms in milk produces the typical kefir. NIKOLAIEWA ... only two organisms as essential to the production of kefir: *Ba... caucasicum* evidently identical with the *Bacillus caucasicus* of FREU... REICH and a kind of yeast fermenting lactose, dextrose, and cane ... The writer is of opinion that any combination of bacteria, or of ... and yeasts that will produce a lactic acid and a mild alcoholic ... fermentation in milk, will make kefir, although to secure the most desi... flavour certain organisms are essential.

HAMMARSTEN shows in the following table the changes brought about ... milk by this fermentation:

Chemical Analysis of Kefir.

Constituents	2 days old	4 days old	6 days old
	per cent	per cent	per cent
...	2.570	2.586	2.564
...mmin ...	.425	.405	.599
...	.071	.089	.120
...	3.700	2.238	1.070
...	3.619	3.630	3.026
...	.641	.624	.630
...id ...	.667	.832	.900
...	.230	.810	1.109

Kefir grains cannot always be obtained, but a good imitation of kefir ... be made by carrying on simultaneously in sealed bottles an alcoholic ... a lactic fermentation. Better results can be obtained by inducing ... alcoholic fermentation in buttermilk. Ordinary bread yeast may be

used for the alcoholic fermentation, but as this yeast does ... lactose it is necessary to add cane sugar to the milk. The ... detailed directions for preparing kefir.

The nomadic tribes of the plains of European Russia and ... south-western Asia prepare a fermented drink called *koumiss* ... milk. Care is taken to produce an acid and an alcoholic ... the necessary bacteria and yeast being thus soon established. ... position of koumiss is shown in the following analysis ... RICHMOND'S Dairy Chemistry:

Composition of Koumiss made from mare's milk.

Constituents	1 day old	8 days old
	per cent	per cent
Water	91.43	92.12
Alcohol	2.67	2.03
Lactic acid	.77	1.08
Sugar	1.63	.50
Casein	.77	.85
Albumin	.25	.27
Albumose	.98	.70
Fat	1.16	1.12
Ash	.35	0.35

It will be observed that this fermentation produces no change could be expected to increase appreciably the digestibility of the ... ous part of the milk, except the possible advantage of a finely divide Kefir and koumiss are limpid, mildly acid and distinctly alcoholic. ... ghurt is a thick-curdled milk, decidedly acid and with very little ... cohol. It is prepared from goat's, buffalo's or cow's milk in the ... bordering on the eastern end of the Mediterranean where it is kn... different names. Unlike kefir there are no "seeds" through wh... fermentation can be transmitted, but the essential organism ... times preserved by drying the fermented milk and reducing the dry m... to powder. This constitutes the "podkwassa" or "maya" ... bacterium essential for the preparation of yoghurt, was probably fi... served by KERN (*Dispora caucasicum*) in 1881. Later, BEYERINCK ... and described it (*Bacterium caucasicum*), and also FREUNDREICH (... *caucasicus*). More recently, RIST and KOURBY (*Strepto-bacillus* ... and *Bacillus lebensis*). GRIGOROFF and COHENDY do not believe it to ... ited to the oriental fermented milks, and recent work by HASTING... NEMANN and HEFFERAN, indicates that this bacterium is widely distri... having been isolated from milk, soil, saliva, fæces, and various sources

They are slender rods 2 μ to 6 or 8 μ in length, breadth usually about 1 μ; flagella and spores absent. Long chains frequently occur. Living cells are gram positive; dead cells are gram negative. This organism does not grow on ordinary media, but on whey, malt, and slowly on whey agar and certain specially prepared media. Most varieties grow equally well in the presence or absence of oxygen. The ability to ferment sugar probably varies in different varieties. This organism growing alone in milk, forms usually a rather slimy, tenacious curd, which does not ordinarily separate from the whey even on long standing, and cannot be broken up into the smooth creamy condition essential to a good buttermilk. Better results are obtained by adding a culture of an ordinary lactic-acid organism; but the best results will be obtained by making buttermilk in the ordinary way and churning it with an equal quantity of milk curdled with the yoghurt organism. Yoghurt may be made palatable by adding two parts cold water, or better still cold aerated water, sugar and lemon juice or other fruit flavour, or chocolate syrup.

The writer concludes by giving directions for making yoghurt for commercial and for home use.

Biochemical Comparisons between Mature Beef and Immature Veal. — Berg, W. W. (Biological Chemist, Bureau of Animal Industry) in *Journal of Biological Research*, Vol. V, No. 15, pp. 697-711. Washington, D. C., January 10, 1916.

In both Europe and America immature veal is popularly regarded as difficult of digestion and unfit for human food.

These investigations were carried to compare immature veal (1-3 weeks old) with mature beef with regard to chemical composition, digestibility and physiological effetes.

Determination of the nitrogen compounds showed no significant differences between the two kinds of meat. In artificial digestion experiments with acid pepsin and alkali trypsin, the veal digested as rapidly as the mature beef.

Cats were fed on a diet in which immature veal was the sole source of nitrogen. The young animals grew normally on the diet and the older ones became fat. A pair of cats after living two thirds of a year on the diet, produced a litter of healthy young kittens which continued on the veal diet with excellent growth.

These results indicate that immature veal is a very suitable meat when its deficiences in fat and possibly in small amounts of undetermined constituents are counter-balanced in the ordinary mixed diet.

Almond Growing and Trade in California. — Piper, C. W., in *The Monthly Bulletin of the State Commission of Horticulture*, Vol. IV, No. 11, pp. 401-405. Sacramento, Cal., November 1, 1915.

According to the most recent statistics, the annual almond crop of California, for the least 10 years, has averaged about 3,000 tons. During the planting seasons of the last five years, the acreage set to almonds has been so large that little, if any, of the almond variety has remained in the hands of the nursery man at the close of the several seasons.

In the opinion of the writer, this increase in the almond produc... will oblige the growers for the future to cooperate and form strong ... nisations, in order to be able to sell the crop at a sufficient remunera... price, in spite of foreign competition. The annual consumption of sh... almonds in the United States amounts to about 16 000 tons, most ... which come from abroad. Of these imported almonds, 80 per cent ... shelled, while, so far, the native product is sold in the shell, especi... from December to February.

In order to put an end to this state of affairs, on the initiative of ... "California Almond Growers Exchange", a large almond-shelling estab... ment has been started at Sacramento; the capacity of the plant is ... 1 carload per day. The "California Almond Growers Exchange" ... which the writer is President, began in 1910 with 11 local associations ... 230 members, it now includes 18 associations and has nearly 900 membe... About 80 per cent of the Californian crop is handled by the Exchange.

The writer is of opinion that within the next 5 years, the almond c... will be nearly 15 000 tons, and that the consumption could also be incre... ed. Seeing the difficulties hitherto met with in the sale of the crop, ... most important problem that presents itself to the almond grower in C... lifornia is the marketing of the output. The positive results already ... tained by the above-mentioned institution, which sells the almonds at ... price, encourage the writer to hope that, in the future, this problem will ... satisfactorily solved, and that the demand for almonds in America w... be entirely supplied by the Californian product.

Brief reference is made to the unfavourable freight rates from C... fornia to the chief eastern markets, as compared with those paid for forei... products; and to the insufficient import duty, in view of the lower cost ... labour in the exporting countries.

457 - **Trade Standard for the Sale of Wine Lees and Tartar.** — *Giornale Vinicolo I...* Year 11, No. 4, pp. 66-68. Casal Monferrato, January 23, 1916.

The price of wine lees and tartar is fixed, not only according to the ... content in tartaric acid or in bitartrate of potash, but also on the basis ... an average standard accepted by the trade. For lees, this standard is ... per cent tartaric acid and 23 per cent bitartrate of potash; for tart... 68 per cent tartaric acid and 80 per cent bitartrate of potash.

458 - **The Sale of Eggs and Poultry in Massachusetts under Guarantee.** — *The Am... Agriculturist*, Vol. 96, N. 23, p. 14. New York, December 4, 1915.

The Massachusetts Poultry Society has adopted, for the use of ... members, an official poultry products guarantee seal for both eggs and dr... sed poultry for the market.

The use of the seal is limited to those members of the society wh... will agree to the following rules:

1) That poultry and eggs shall be produced under clean and sa... tary conditions.

2) The poultry and killing houses shall be open at all reasonal... times to inspection by members of the executive committee of said as... ciation.

3) Eggs shall be gathered at least once a day, and when shipped or sold shall be not more than seven days old.

4) No unwholesome food shall be fed to the poultry.

5) Shells shall be clean in every case.

6) No eggs which have been in an incubator shall be shipped or sold under said seal.

7) Eggs shall weigh not less than 24 ounces to the dozen.

8) Dressed poultry shall be fresh killed.

9) No diseased poultry shall be killed and sold for table use.

10) The right to use said seal is forfeited whenever this agreement is in any respect violated, the member being held to reimburse said association for all payments and expenses made and incurred by it (after investigation and satisfactory proof) by reason and on account of inferior quality of poultry products shipped or sold under said seal.

PLANT DISEASES

DISEASES NOT DUE TO PARASITES OR OF UNKNOWN ORIGIN.

450 - **The Influence of Meteorological Factors on the Development of Plant Diseases.**
– DOROGIN G. I., in *Materiali po Mikologhii i Fitopatologhii Rossii*, 1st Year, pp. 1-70 (with 1 graph). Petrograd, 1915.

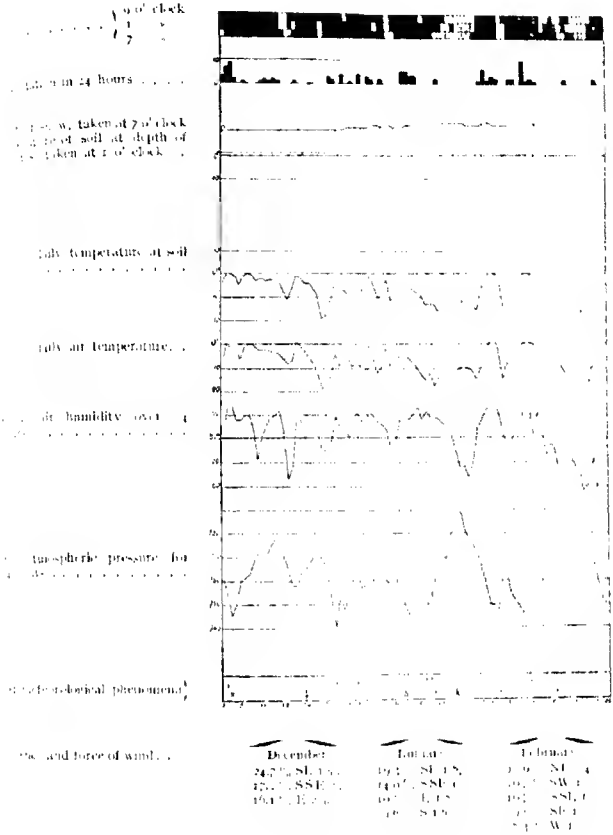
Although it has been long known that meteorological factors exert a very definite influence upon the appearance and propagation of plant diseases, practically no continuous and methodic work has yet been done on this important problem. The Bureau of Mycology and Phytopathology of the Russian Ministry of Agriculture, aware of the necessity for a continuous series of observations on the development of fungoid diseases in relation to the progress of the weather, has set aside a chapter in its quarterly Bulletin for the publication of meteorological data, accompanied by graphs and diagrams. Observations are made of the following: air temperature, soil temperature (at surface and at depth of 10 to 25 cms.), relative humidity of atmosphere, humidity of soil at surface and at a depth of 10 to 25 cms., total precipitation, cloudiness, depth of snow, frequency and force of prevailing winds. Note is also taken of variable meteorological phenomena, such as extremely high and extremely low temperatures, frosts, hoar-frosts, hail etc. the action of which on plants is obvious.

In order to simplify reference to the Bulletin and its diagrams instead of the usual 3 observations daily, in certain cases an average is taken for 24 hours or simply of 10 days. Although changes in atmospheric pressure have no perceptible influence on plants, a pressure curve is included in the diagram in order to complete the data.

The following rules have been established for the construction of the diagrams:

1) Values equivalent to 0.5 are indicated in the middle of the square; values above 0.5 are taken as equal to 1 and lower values are not indicated at all.

Winter 1914-15.



2) When the thickness of snow is inferior to 0.5 decimeters it is indicated by a single line which practically coincides with zero.

3) The soil temperature at a depth of 25 cms. from 0.5° to 1° is included as equivalent to 0.5.

4) The quantity of rain from 0.5 to 1.0 mm. is indicated by a single line.

5) Cloudiness equal to 4 (sky totally covered) as shown in black; cloudiness equal to 1, 2, 3 (sky $^1/_4$, $^1/_2$, $^3/_4$ covered) in grey. In the case of complete absence of cloud there remains a white square at the corresponding point of the diagram.

460 - **Yellowing of Sugar Beets in France during 1915** (1). — ARNAUD, G., *d'Agriculture pratique*, Vol. 29, No. 3, p. 50. Paris, February 10, 1916.

With reference to the yellowing of sugar-beets observed in [illegible] of France during the summer of 1915, the writer excludes any infection on the part of a pathogenic agent and is of opinion that the [illegible] due entirely to meteorological and cultural causes. It is considered in light, sandy, dry soils containing little nitrogen, and similarly in clayey soil of higher ground, the beets must have suffered from want of sufficient water, lack of cultivation and the smaller amount of nitrogenous fertilisers applied, and late sowing.

On the specimens examined were found various fungoid and [illegible] parasites (*Cercospora beticola*, *Uromyces Betæ*, *Phoma tabifica* and *Leptosphæria eronymi*) but they are not considered as being of any importance with regard to the production of the disease.

DISEASES DUE TO BACTERIA, FUNGI AND OTHER LOWER PLANTS.

461 - **Contribution to the Mycological Flora in the Neighbourhood of Kieff** (Russia). JAVORSKI, A., in *Biuro po Mikologhii i Fitopatologhii Uchastka Comitato Zemledielia, Materiali po Mikologhii i Fitopatologhii Rossii*, Year I, Part [illegible]. Figs. 1-14. Petrograd, 1915.

A list of 72 Hymenoycetes collected near Kieff between [illegible] 1915. Among the species injurious to cultivated or useful plants: *Exobasidium Vaccinii* Woronine on *Vaccinium Vitis-Idæa*; *Stereum sulcatum* Pers., on the trunks of hazel, oak and birch; *Merulius lacrymans* (Wulf) Schum; *Daedalea quercina* (Linn.) Pers.; *Trametes pini* (Thore) Fr.; *Polyporus* (*Fomes*) *pinicola* Fries and *Polyporus* (*Fomes*) *fomentarius* (Linn.) Fr.

The last is nearly always found on birch, less frequently on poplar and alder. The fungus which develops on poplar differs from the characteristic form on birch, by its fructifying organs being less consistent and almost devoid of concentric furrows.

Among the Polyporaceae are: *Poliporus Schweinitzii* Fr., *P. squamosus* Fr., *P. sulfureus* Fr., *P. imberbis* Fr., and *P. betulinus* Fr.

462 - **Contribution to the Mycological Flora of the District of Tersk** (Caucasus). VORONICHIN N., *J.*, in *Biuro po Mikologhii i Fitopatologhii Uchastka Comitato Zemledielia, Materiali po Mikologhii i Fitopatologhii Rossii*, Year I, Part III. Petrograd, 1915.

A list of 91 species of parasitic and saprophytic fungi collected in the summer of 1914 in the district of Tersk. The following are new to science: *Cercosporella Lini* Woronich., on the leaves of *Linum usitatissimum* Waldst. and Rit. and *Rhodosticta onobrychidis* Woronich., on the living leaves of *Onobrychis sativa* Lam.

(1) See also *B.* Jan. 1916 No. 117, and *B.* March, 1916 No. 357.

Eleven species are recorded for the first time in Russia : *Puccinia [illegible]* Lagerh., on the leaves of *Teucrium* sp.; *Phyllosticta fagina* Pech. on the leaves of beech ; *Phyll. physaleos* Sacc., on the leaves of *Physalis alkekengi* L. ; *Cytospora tiliae* Sacc., on the leaves of lime ; *Stagonospora cirsii* Hollós, on the leaves of *Sonchus* sp., *Septoria cruciatae* Rob. and Desm., on the leaves of *Galium cruciatum* Scop ; *S. meliae* Pass., on the leaves of *Melica uniflora* Retz. ; *S. nepetae* El. A. E., on the leaves of *Nepeta cataria* L. ; *S. poae trivialis* Coce., on the leaves of *Poa nemoralis* L. ; *Marsonia [illegible]* Sacc. on the leaves of *Melampyrum album* Gm., *Cercosporella veronicae* Peck., on the leaves of *Veratrum album* L. ; *Ramularia oncophila* Sacc., on the leaves of *Astrantia major* L., and *Cercospora cypripedii* Ell. et Dearn., on the leaves of *Epipactis latifolia* All.

Amongst the species most injurious both to cultivated and to wild plants are : *Septoria piricola* Desm. and *Gymnosporangium sabinae* Wint., on pear ; *Microstoma juglandis* Sacc. which attacks the leaves of walnut ; *Gloeosporium cinerea* Bonord., which produces fruit rot ; and *Clasterosporium carpophilum* Aderh., which attacks the leaves of *Prunus*.

Widely spread and common in the zone explored by the writer are also *Cylindrosporа fraxini* Sacc. and *Septogloeum ulmi* Br. et Cav., on the foliage of ash and of elm ; more rare are : *Oidium dubium* Jacz. and *Phyllosticta carpinea* Peck., which is found on beech.

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Contribution to the Mycological Flora of the District of Suchum. (Russia)

SIEMASZKO W., in *Bulletin pour Mykologie et Phytopathologie Russes = Zemlevedenie i Zemledelie, Materialy po Mikologii i Fitopatologii Rossii*, Year I, Part [illegible], pp. [illegible], Figs. 9-10. Petrograd, 1915.

A list of 217 species of fungi collected during the autumn of 1913 and spring 1914 in the district of Suchum and other parts of Transcaucasia along the coasts of the Black Sea.

The following are new to science : 1) *Mycosphaerella phaseolorum* Siemaszko, a Pyrenomycete which, occurring on the leaves of *Glycine soja*, *Phaseolus mungo*, and *Vigna rubia*, forms whitish spots with a darker border ; this fungus is very similar to *Mycosphaerella phaseolicola* (Desm.) Sacc., from which, however, it differs in shape and in the dimensions of the spores ; 2) *Sphaerulina suchumica* Siemaszko, another Pyrenomycete, which was found on the leaves of *Gossypium barbaceum* and *Hibiscus esculentus* ; *Exobasidium citri* Siemaszko, which attacks the unripe fruit of *Citrus* sp. on which it develops as a whitish, hard, sclerotic crust ; mandarin is the favourite host-plant ; this disease resembles very closely in its external characters the "incalcinatura" of the lemon of SAVASTANO and "white rust of lemons" described by BRIOSI and FARNETI, which, according to those writers, is due to *Oculuria citri* Br. et Farneti, together with several other fungi ; 4) *Cercosporella epimedii* Siemaszko, which forms on the leaves of *Epimedium pinnatum* var. *colchicum*, large round spots of a dirty white with dark-grey border ; this fungus was found in a forest on the banks of the river Kelossuri near Suchum ; 5) *Ramularia trachystemonis* Siemaszko which forms a whitish veil on the leaves of *Trachystemon orien-*

talis; 6) *Cercospora guizotiae* Siemaszko, which causes grey spots on the leaves of *Guizotia oleifera*.

464 **New Record of *Puccinia Galanthi*, in Austria.** — KEISSLER K. in *Botanische Zeitschrift*, Year 65, No. 7-8, pp. 230-238. Vienna, 1915.

In 1833 a new fungus was reported by UNGER as occurring on leaves of *Galanthus nivalis* taken from the meadows near Stockerau, Austria. He named this fungus *Puccinia Galanthi*, but no accurate description was made. The parasite was lost sight of for a long time. VON BECK found it in his garden at Währing, near Vienna. The fungus has been described by WINTER.

At about the same time, the presence of *P. Galanthi* was reported in Hungary by LINHARD.

Fifteen years later, in 1897, BUBAK reported a new habitat for the fungus in Moravia and described the parasite.

Up to 1897, therefore, this fungus had been recorded in four distinct habitats; since that date there is no further record of its occurrence.

During an excursion made in May 1915, in the valley of the Iser, the writer found no trace whatever of the fungus. A week later in visiting the same places, he found it in such quantities as to be able to make a large collection. It was also noticed to occur on very young plants.

The distribution of the fungus shows clearly the existence of a centre of infection where the plants are very strongly attacked, while towards the periphery of the infected zone the fungus becomes gradually rarer.

Research on the method of reproduction of *P. Galanthi* has shown that the spores occur on the under surface of the leaves.

As it forms no spots on the leaves it is extremely difficult to identify. Research on this point is being continued. From a systematic point of view it is noted that *P. Galanthi* closely resembles *P. Schroeteri* and that it attacks *Narcissus poëticus*.

Besides *P. Galanthi* another species of Uredineae is reported, *Uromyces Galanthi*, Schröt, which differs from the first by the paler colour of the spores. The teleutospores develop on *Salix fragilis*. This species has already been reported from several places.

Both these rusts have been found repeatedly on the same leaf, but no genetic relation is thought to exist between them.

465 **Relation between the Concentration of Hydrogen Ions and the Natural Immunity of Plants.** — WAGNER J. in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 44, No. 24-25, pp. 708-710. Jena, January 12, 1916.

The writer had previously noticed that the injection of phytogenic bacteria into certain plants, produced in their tissues, in addition to bactericidal substances, a variation in the concentration of the hydrogen ions.

Plants of *Sinapis alba*, *Brassica oleifera*, *Sempervivum Haworthii* and tubers of potatoes were inoculated with pure cultures of *Bacillus fluorescens* or of *Bac. phytophthorus*, or of *Pseudomonas campestris*. *Brassica* and *Sempervivum* were kept in an unheated glasshouse. *Solanum* and *Sinapis*

the open. The potato tubers were kept during the experiment in a room at a temperature varying between 22° and 30° C. Before injecting the bacteria, the portion of the plant treated was washed in a 3% solution of hydrogen peroxide and well dried with alcohol. Some time after the wound, a sample of sap was taken from the plant and tested for its bactericidal power and for its acidity or the concentration of the hydrogen ions. The variations in the concentration of the ions are regarded as part of the reaction against the injection of the phytopathogenic bacteria. Immediately after the injection the acidity of the sap decreases, but increases again immediately the first symptoms of the disease appear. If after infection the plant is able to resist the disease, the concentration of the hydrogen ions decreases and after a certain time becomes the same as in healthy plants. When the plant is unable to withstand attack the concentration of the hydrogen ions augments greatly, subsequently falling below that of normal plants.

Sugar canes Resistant to Root-rot and Maize Resistant to Insect Attacks, in Cuba. See No. 936 of this *Bulletin*.

Angular Leaf Spot of Cucumbers in America caused by *Bacterium lachrymans*. — SMITH, ERWIN F. and BRYAN, MARY KATHERINE in *Journal of Agricultural Research*, Vol. V, No. 11, pp. 405-415, Pl. XLIII-XLIX. Washington, D. C., 1916.

The angular leaf spot of cucumbers (*Cucumis sativus*) has been known in the field for many years, but so far no organism has been named as its cause, though it has generally been conceded to be of bacterial origin. F. BURGER, of Florida, and G. B. TRAVERSO, in Italy (1), are responsible for most of the literature on the subject.

From the examination of material from a number of different sources, the writers have identified and described the organism responsible for the disease as *Bacterium lachrymans*.

The disease is characterised by angular brown spots which tear or drop out when dry, giving to the leaves a ragged appearance. Young stems and petioles may become soft-rotted or cracked open. In the early stages bacterial exudate collects in drops on the lower surface during the night and dries whitish. During the early stages bacteria have been isolated from this liquid. These are white in colour, very motile, 0.8 μ in width and 1.1 to 2 μ long, grouped in couples and more rarely united in chains consisting of as many as 12 individuals.

The optimum growth temperature lies between 25° and 27° C., exposure to direct sunlight is fatal in 0.5 per cent. cases and exposure for a few minutes only to low temperatures kills 90 per cent. Inoculation experiments with *Bacterium lachrymans* on healthy plants gave absolutely positive results.

The organism penetrates into the leaves through the stomata and taking up its position in the cavities beneath, spreads into the surrounding tissues, giving rise to the pathological symptoms already noticed.

(1) See *B.*, June 1915, No. 636.

This disease has already been recorded in the following parts of America: in Michigan at Big Rapids, Muskegon, Grand Haven, Holland, Grand Rapids, Hudsonville; in Indiana at Plymouth, Monterey, Tyner and Hudson; in Wisconsin at Racine, Portage, Ripon, Princeton and Milwaukee; in New York State at Constable, Malone, North Lawrence and Long Island; in Connecticut, in the district of Columbia, in Maryland and in the Southern States. In Canada the same disease is known in the provinces of Ontario and Quebec.

Considering the results obtained in the laboratory with copper sulphate, it would seem that Bordeaux mixture properly applied is the best remedy for this disease.

468 - **A Celery Fungus (*Septoria Petroselini* var. *Apii*) New to Yorkshire**
ROE, T. B. in *The Naturalist*, No. 708, pp. 14-15. London, 1916.

Septoria Petroselini Desm. var. *Apii* Br. and Cav., injurious to celery, has just been recorded in the Scarborough district. This fungus is new to Yorkshire. Although previously known on the Continent and in N. America, the first authentic record of its appearance in England was in 1900, in South Devon. Since then it has caused much damage to celery both in England and Ireland.

In 1914, three quarters of a crop of 30,000 head of celery were lost through this disease alone. In 1915, though it did not make its appearance with the same severity, still the damage caused was considerable.

The disease is usually observed about the end of July or beginning of August after it has become well established.

As it has been proved that the "seed" has been known to contain fruits of the fungus, washings from which have been made by experiment to infect healthy plants, it would be advisable for growers to watch their *young* plants, and at the first sign of the disease to spray them with dilute Bordeaux mixture or potassium sulphide solution. As a precautionary measure, microscopical examination of samples of "seed" might be made, and if the fungus be detected thereon, washings in a fungicide might be tried, although it is possible that this would be little more than a palliative. Growers should promptly burn all diseased foliage. The practice of throwing diseased plants on to a rubbish heap is a great mistake as there is no doubt that the fungus can live through the winter and attack the young plants the following year.

It is said that with many visitations like that of 1915, celery growing would become impracticable.

This disease should not be confounded with that caused by *Phyllosticta apii* Halsted, from which it is distinguished by the shape of the spores.

469 - ***Peronospora parasitica* and *Septoria Petroselini* var. *Apii* Injurious to Broccoli and Celery in Latium.** — SEBASTIANELLI A. in *La Nuova Agricoltura del Lazio*, Year IV, No. 73, p. 20. Rome, Feb. 1, 1916.

Peronospora parasitica is very prevalent in the market gardens of Velletri, Cori, Cisterna etc. on the leaves of broccoli. Recently, the spread

(1) See *B.*, Oct. 1914, No. 957.

disease has become so serious that in some gardens but very few plants escaped damage. Celery was very severely attacked by *Septoria Petroselini* var. *Apii*.

Diseases and Pests of the Cranberry, *Oxycoccus (Vaccinium) macrocarpus*, in the United States — FRANKLIN H. J. in *Massachusetts Agricultural Experiment Station, Bulletin* 160, Report of Cranberry Substation for 1914, pp. 91-117, 1 plate, Mass., 1915.

Fungous diseases. — These studies were carried on in cooperation with the Bureau of Plant Industry of the United States Department of Agriculture.

The "ring worm" trouble (commonly so-called because it was formerly supposed to be the result of the work of some insect) was given some study. Vines die in a small patch at first and, the centre recovering, the affected area gradually becomes circular. These patches persist for years, the vines on the outer side of the rim dying every season, while recovery takes place on its inner side, the circle thus growing larger yearly unless stopped by a ditch or some other obstruction. One grower has obtained good results by making 2 or 3 treatments in successive years with Bordeaux mixture.

The disease known as "false-blossom" hitherto only known in Wisconsin has been recorded for the first time in Massachusetts. The disease appears evidently of a very serious character and very infectious.

The disease called "Blossom-end rot" is the chief cause of decay among "Late Howe" berries in storage. Its exact place in botanical classification is not yet determined.

As regards methods of treatment of fungoid diseases experiments have been continued with Bordeaux mixture on plots manured and unmanured. Records were kept of the crop yield obtained and its keeping qualities. The results were contradictory but, generally speaking, the treated plots gave better crops and smaller fruit than the control plots; spraying is therefore not to be recommended except in the case of plantations which are exceptionally severely attacked.

Treatment with Bordeaux mixture (Dr SHEAR'S formula) at the flowering period caused a diminution in the crop yield of more than 50 per cent.

Attempts at treatment were also made by dissolving copper sulphate in the irrigation water (1 part in 50 000 parts of water). The yield was not affected.

The lack of success with the above treatments is probably due to their ineffect on the roots.

Sanding of the plantations did not appreciably increase the yield, but encouraged fungoid diseases and impaired the keeping qualities of the fruit.

Insect pests (1). — The army worm (*Heliophila unipuncta* Haworth)

(1) See also *B.* Dec. 1915, No. 1301. (*Ed.*)

attacked plantations of *Vaccinium* at Cape Cod, but except in a few cases the damage caused was not serious.

The "gipsy moth" (*Porthetria dispar*) caused considerable damage to *Vaccinium* in several localities and is becoming more of a menace each year.

The "cranberry weevil" (*Lithonomus uniformis* Lec.) which usually harms a bog by working within the blossom buds and eating out the hearts, did much damage on some bogs in Plymouth in 1914; it also caused some loss in the same locality this year.

Arsenical sprays ("Bordo" lead with Paris green) applied during the flowering period did good service.

The "spanworm" (*Epelis truncataria* var. *faxonii* Minot) did much damage in a bog at Wareham. Several of the pupae were found to be parasitised by an Ichneumon new to science (*Campoplex variabilis* Cress.). Pupae were found after the bog had been submerged for five months.

The dying of the tips which has often been noticed at intervals is due to attacks by the larvae of the "cranberry tip worm" (*Cecidomyia oxycoccana* Johnson).

Both eggs and larvae were found on the tips (as many as 5 on a single tip); the larvae form their cocoons in the soil. Flowed bogs, in case they had not been resanded before the 1st of May were, as a rule, much more seriously injured than were strictly dry bogs (without winter flowage). Flowed bogs which had been resanded the previous autumn or in the spring before the 1st of May were, as a rule, much less seriously injured than those not resanded. No bog showed great tip worm injury after a period of severe frosts. The "Late Howe" variety, as a rule, showed distinctly more injury than did the "Early Black".

For the control of the "flowed bog fireworm" (*Rhopobota vaccinii* Pack), in addition to the remedies already cited, the writer recommends treatment with sweetened arsenical sprays.

Nearly a dozen natural enemies of the "cranberry fruit-worm" have been identified and bred, only 3 are abundant enough to be of importance: a Braconid (*Phaneroloma tibialis* Hldd.), a species of Ichneumon *Pimendia agilis* (Cress.) Ashm.; a Chalcidid (*Trichogramma minuta* R.).

471 **_Puccinia Iridis_ on Cultivated _Iris_, New to Yorkshire.** — Rob. T. Hall, in *The Naturalist*, No. 708, p. 27, London, 1916.

Puccinia Iridis Wallr. is recorded for the first time on cultivated *Iris* in some gardens at Scarborough.

472 **Apple Tree Mildew, _Podosphaera leucotricha_ Salm., New to Yorkshire.** Rob. T. Hall, in *The Naturalist*, No. 708, p. 27, London, Jan. 1916.

The above is a first record for Yorkshire of *Podosphaera leucotricha* Salm. The apples attacked were from trees at Ebberston, near Scarborough and had suffered severely, being small in size and studded with perithecia of the fungus. The specimens found were in the ascigerous or perfect stage which is apparently rare in England, the oidium conidial stage being that usually met with.

"Sooty Blotch" of the Pear (*Leptothyrium carpophilum*) in England.
SALMON E. S. and WORMALD H. In *Ann. of Applied Biology*, Vol. CIX, No. [illegible], pp. 55-60, Figs. 28-28. London, Jan. 28, 1922.

The writers have met with two instances where pears of the "Catillac" variety — in one case grown in a garden at Reigate, Surrey and in another case at Wye, Kent — become severely attacked by the "Sooty Blotch". The disease is probably due to *Leptothyrium carpophilum*.

The writer describes the points of difference between this latter organism and *Lept. Pomi* which causes the "sooty blotch of the apple".

Sclerotinia Linhartiana on Quince, New to Bulgaria. MANDJSOW V. in *Izv. Polit. Nauchn. na Bulgarskoto Zemlisdelie*, Sofia, Year XX, Vol. [illegible], pp. 106-[illegible], Sofia, 1918.

The disease of quince caused by *Sclerotinia Linhartiana* Prill. et Del. the conidial form of which is known by the name of *Monilia Linhartiana* Sacc., has been reported for the first time in Bulgaria at Borisovgrad, Sadovo (Plodvisko) Ternovo, Rinstendit, and Giumugina. In damp weather the pest spreads with great rapidity and in a few days as high a proportion as $\frac{1}{20}$ of the foliage may be affected. The fungus attacks the leaf near the petiole, spreads along the mid-rib and following the larger veins, gradually covers the entire leaf.

Irregular spots of a dirty-white colour appear on the surface of the leaf; these gradually coalesce and become covered with a whitish veil of the hyphae and conidia of *Monilia*. These conidia, through insect agency gain access to the flowers and germinate, developing a branching mycelium which eventually reaches the ovary. The processes of fertilization, swelling and formation of the fruit are thus very materially affected and when winter comes all the infected parts fall to the ground.

In the spring, the apothecae of *Sclerotinia* develop on the fallen fruit and the ascospores which form attack in their turn the young growing fruits, thus spreading the disease over a still wider area.

The following methods of control are advised:

1) Cutting off all infected parts and destroying by burning;

2) Spraying with Bordeaux mixture before the leaves begin to bud, as a preventive measure;

3) Dusting the diseased plants with calcium sulphate.

A Honeycomb Heart Rot of Oaks Caused by *Stereum subpileatum*.
LONG WILLIAM H. in *Journal of Agricultural Research*, Vol. V, No. [illegible], pp. 421-425, Pl. XLI. Washington, D. C., 1916.

During investigations made in 1914, 1915 and 1916 on the pathological condition of the oak (*Quercus* spp.) in the National Forests of Arkansas and other sections of the United States, the writer found a large percentage of the trees, especially in some regions of Arkansas, attacked by various species of heart rotting fungi. Among these were *Polyporus pargamenus*, *P. berkeleyi*, *P. frondosus* and *P. dryophilus*. In addition to the foregoing a new type of rot was found caused by *Stereum subpileatum*.

In the final stage of this rot the diseased wood resembles a piece of honeycomb, hence the name.

So far, this rot has been observed, in Arkansas, on *Quercus alba, Q. lyrata, Q. palustris Q. phellos, Q. rubra, Q. texana, Q. velutina;* in Florida on *Q. virginiana, Quercus* sp. and *Liquid-ambar styraciflua;* in Kentucky on *Quercus* sp. (?); in Louisiana, on *Q. lyrata;* in Mississippi, on *Q. Sp.*; in Missouri on *Q. palustris* (?); in Virginia, on *Q. alba, Q. coccinea, Q. Prinus* and *Q. velutinea;* in Mexico on *Quercus* (?).

The only practicable method of control which can be applied to the forest as a whole is to prevent, so far as possible, the infection of the trees. This can be done 1) by eliminating all forest fires, since they produce wounds on the butts of trees through which the fungus enters; 2) by preventing the formation of the fruiting bodies (sporophores) of the fungus which produce the spores. This can be done by destroying all diseased timber which contains this rot.

INJURIOUS INSECTS AND OTHER LOWER ANIMALS.

176 - **The Psyllidae of the Clevelands (England).** — HARRISON, J. W. H. in *The Naturalist*, No. 707, pp. 101-107. London, 1915.

The following is a list of some of the Psyllids found on useful plants over a limited section of the Cleveland area:

Aphalara calthae Linn. on larch and spruce; *Psyllopsis fraxinicola* Först., *P. fraxini* Linn. and *Psylla pyricola* on ash; *Psylla salicicola* Först. on *P. ambigua* Först. on sallow; *Psylla hartigii* Flor., on birch; *P. pineti* Flor. on conifers; *P. melanoneura* Först on oaks and conifers; *P. costalis* Flor. on blackthorn, hawthorn, mountain ash, oak, etc.; *P. peregrina* Först. on hawthorn; *P. mali* Schm., on crab apple; *P. alni* Linn. at *P. försteri* Flor. on alder; *Trioza urticae* Linn. on elm, blackthorn etc., *T. albiventris* Först. on sallow and silver fir.

177 - **The Asparagus Beetle Egg Parasite.** - ROSS, W. A. in *The Agricultural Gazette of Canada*, Vol. 2, No. 11, pp. 1055-1056, 3 Figs. Ottawa, 1915.

Early in the month of June, 1915, large numbers of a minute, dark blue-green, four-winged chalcid fly were found destroying the eggs of the Asparagus beetle, *Crioceris asparagi* L., at Vineland Station, Ontario.

The female, by means of a sharp ovipositor, pierces the egg of the Asparagus beetle and deposits within it her own eggs (three to nine in number). In due course the beetle egg, its viability unaffected, hatches and the grub grows to maturity.

The larvae of *Crioceris* resist for some time, and reach the pupal stage but they are then killed. The adult chalcid is a voracious feeder on the eggs, accounting for as many as 90 per cent. At the Vineland Station Experimental Farm the work of the egg parasite was so effective that it was found possible to dispense with the customary spraying of the asparagus plants.

178 - **Appearance of Swarms of *Contarinia tritici* in South Russia during 1914.** - BORODINE D. N. in *Khozaistvo*, No. 13-14, pp. 1023-1029. Kiev, 1915.

Russian entomology makes but rare mention of *Contarinia tritici* Kirby. Amongst the few who have treated the subject is quoted N. M. Ki-

[illegible] who wrote, in 1913, that in Russia not much harm was done to [illegible] by this member of the Diptera. Two years later, however, the [illegible] appeared in swarms in the two South Russian provinces of Poltava [illegible] Kherson, especially in the former. Observations made by the writer [illegible]self and communications received from correspondents of the Ento[illegible]gical Department of the provincial Zemstwo of Poltava have shown that [illegible] fruit insects made their appearance between May 9 and 20 (old style). [illegible] writer, however, believes that period to have been a good deal longer. [illegible] oviposition took place over the whole of the time and about June 12 [illegible] numbers of the larvae were hatched and continued to appear up till [illegible]ost time. Their number then greatly diminished, especially after [illegible]ain. The descent of the larvae to the soil to pupate occurred towards [illegible]e 20, when rain began to fall and the number of larvae on the ears la[illegible]ly diminished; finally they quite disappeared. After the disappear[illegible] of the larvae from the wheat harvested in the fields of the Experi[illegible]tal Agricultural Station of Poltava, a careful search was made for them [illegible] the soil beneath the sheaves, but with no result. A number of larvae [illegible] *atrima* were put into small glass tubes during the months of June [illegible] July 1914. Although the conditions were most unfavourable owing to [illegible] sand of the boxes in which the tubes were placed not having been [illegible]ed since the spring of 1913, and watering only being carried out in the [illegible]dle of May, between June 2 and 8 a number of parasites were bred [illegible] the larvae and identified by N. W. Kourdjoumow as *Genitocerus* [illegible]*ensis* Nees (8 specimens). *G. clavicornis* Thomas (3 specimens), [illegible] *cerus* sp. (1 specimen).

In order to ascertain the amount of damage caused by *Cont. tritici* [illegible] number of larvae and cocoons on each ear were counted, and also the [illegible]ber of injured grains. The percentage of the injured grains was cal[illegible]ted on the total number of grains contained in a 100 ears of corn. Usi[illegible] the proportion of ears attacked was 80·00 per cent. The propor[illegible] of damaged grains 10,06 per cent.

In the following table are given the results of 7 examinations:

Species attacked	Date of sowing	Date of examination	Number of ears	Total number of grains	Number of injured grains	Percentage
Spring wheat	—	June 11–13	100	2 106	212	10·016
"	August 5	" 27	100	2 736	267	9,75
"	" 13	" 27	100	2 298	141	6,20
"	" 25	28	100	2 154	26	1,89
"	September 5	30	100	2 621	19	0,72
Spring rye	—	16	100	3 896	175	4·49
Spring wheat	—	20	93	1 386	212	15,2

The amount of damage caused is correlated with the time of sowing, for, as may be seen by examinations 2, 3, 4, and 6, the early sowings are most severely attacked, a fact which is probably connected with the swarming period of *Contarinia*. Comparing the damage caused to wheat by other insects the most serious is that caused by *Contarinia*, and the attention of entomologists is drawn to the fact that the insect in question caused in North America damages assessed at some millions of dollars.

179 **The Influence of Rainfall and the Non Burning of Trash on the Abundance of *Diatraea saccharalis*, Injurious to the Sugar Cane** (1). — Wolcott (G. N.) in *Cost. of Porto Rico, Board of Commissioners of Agriculture, Insular Experiment Station, Rio Piedras, P. R., Circular No. 7*, pp. 1-6, 1 diagram. San Juan, Porto Rico, 1915.

The most important insect injurious to sugar cane in the West Hemisphere is the smaller stalk-borer, *Diatraea saccharalis* Fabr. which occurs in abundance in the southern United States, Mexico, Cuba, Jamaica, Santo Domingo, Porto Rico, St Kitts, Barbados, Trinidad, Demerara and Argentina, besides other islands and countries of lesser importance in sugar production.

The extent of the damage caused by this insect varies in different localities and between very wide limits. As a result of numerous observations and researches, the writer has been able to fix the following points:

1) There is an inverse relationship between the total annual rainfall and the abundance of *Diatraea*.

2) The burning of trash on the field after the cane is harvested kills large numbers of *Trichogramma minutum* Riley, the most effective enemy of *Diatraea*, and consequently favours the development of this borer. This is found to be true for all localities and the burning of trash is therefore to be discouraged.

It is particularly important to draw the attention of planters to this fact, as one of the most common methods used for the control of insect pests is precisely that of burning the trash on the fields.

Diatraea is not abundant in Jamaica, but there is a noticeable difference between the north and south sides. On the south side, *Diatraea* infests 15 to 30 per cent of the stalks. The difference is due to the amount of rainfall, the total precipitation being much higher in the north where the insects are scarcer.

In Barbados the scarcity of rain favours the development of the pest nor does the presence of *Trichogramma* act as a sufficient check.

In Cuba, in the sugarcane districts of Havana, Matanzas and Santa Clara, where the annual rainfall averages from over 50 inches to more 90 inches, *Diatraea* attacks about 10 per cent of the canes. In Camagüey and Oriente provinces where the annual rainfall is from 30 to 50 inches the infestation by the borer is 40 per cent.

(1) See also *B.* Oct. 1915, No. 1206.

The following table gives data relating to Porto-Rico:

Locality	Rainfall of 1914	Percentage of infestation 1914 by			
		Average of all fields	Fields where trash was burned	Fields where trash was not burned	
[illegible]	104	0 (8)	. . . .	0	(8)
[illegible]	95	5 (6)	. .	8	(6)
[illegible]	*70	11 (13)	13 (6)	9	(6)
[illegible] Motrovis	72	0 (6)	10 (3)	1	(3)
[illegible] Vallas	70	11 (9)	. . .	11	(4)
[illegible] Baja	70	15 (8)	10 (4)	19	(4)
S. Pedros	66	17 (7)	. . .	17	(7)
[illegible] Bajo	60	39 (9)	44 (5)	26	(4)
[illegible]	58	0 (5)	. . . .	0	(5)
[illegible]	58	37 (5)	60 (2)	22	(3)
[illegible]	55	26 (19)	60 (11)	13	(8)
[illegible] Diaz	50	32 (9)	31 (8)	18	(1)
[illegible]-Josefa	45	17 (4)	4 (4)	.	.
[illegible]	34	15 (7)	50 (5)	31	(2)
[illegible]	27	37 (6)	11 (6)	24	(3)
[illegible]	25	48 (8)	48 (8)	.	.
[illegible] Salinas	23	94 (5)	77 (4)	11	(1)
[illegible]	24	76 (5)	76 (5)	.	.
[illegible] Isabel	22	2 (4)	75 (3)	40	(1)
[illegible]	21	66 (28)	68 (24)	31	(4)

* Average of rainfall of *last month*, not of the years. Figures in brackets after percentages indicate number of fields examined.

The eggs of *Diatraea* are deposited on the leaves of the cane, and when the young larvae hatch a considerable interval elapses while they crawl about on the cane before they enter the stalk, or midrib of the leaf. A heavy fall of rain during this period would wash them on to the ground, where they would fall an easy prey to natural enemies, especially *Solenopsis geminata* ("hormiga brava").

(18) **_Phlyctaenodes sticticalis_, Micro lepidopteron Injurious to Tobacco in Roumania** (1). KNECHTEL WILHELM R. in *Diatraea Grandiosella* at Rome. *Monofphuridae Studiu, Bukarest*, Year III, Part II, IV, pp. 24, 26 Figs. 2. Bucharest, 1915.

During 1915, *Phlyctaenodes sticticalis* has been found attacking tobacco in the east of Rumenia. It had been previously recorded (1900 and after) as injurious to field crops, particularly tobacco.

(1) See *B.* Jan. 1915, No. 124.

The larvae have been reported from various parts of Eastern Wallachia and of Northern Dobrugia, especially from the province of Jalomitza, Falciu, where they appeared on July 4 in the commune of Cretesci. In this latter place fifteen plantations were attacked, two being completely destroyed. They were also observed in the provinces of Prahova, Dambovitza (communes of Ghidigheni and Carlomanesti), Solesti Vaslui (communes of Vaslui (communes of Lipovat, Deleni, Munteni, Naujesti) Macin, Tulcea and Badadag Tulcea. They are commonly known as "Omida Rosie".

The tobacco-leaves are attacked at the margins and gradually eaten until only the skeleton remains. Damp and rainy weather favours the development and spread of the insect, whose attacks coincide with the rainy seasons. Among the natural enemies of *Phl. sticticalis* is a Gregarine, *Mikroklossia prima*, already recorded by KRASSILTSCHIK. As regards means of control, the direct destruction of the larvae and the isolation of infected centres are recommended; also spraying with insecticides, disinfection of the soil, and burning of all vegetable refuse and of any other infected matter.

181 **The Pavement Ant (*Tetramorium cespitum*) as a Pest of Coldframe and Greenhouse Crops in Virginia** (1). — SMITH LOREN B. in *Virginia Truck Station, Bulletin*, 19, pp. 353-405, Figs. 72-83. Norfolk, Virginia, 1915.

During the past two years, horticulturists in the Norfolk region have been suffering losses from the attacks of the pavement ant. This insect is a native of Europe and was introduced into America probably 150 to 200 years ago. Since that time it has become quite widely distributed throughout the Eastern United States; it is only recently, however, that it has been reported as injurious to vegetable crops.

Two species occur in the above region which might be confused with the pavement ant: the red ant (*Monomorium pharaonis* L.) and the little black ant (*Monomorium minutum* Mayr.) These can be distinguished by their smaller size and difference in coloration.

T. cespitum has been observed to feed on the following vegetables: kohl-rabi, cauliflower, cabbage, eggplant, Brussel sprouts, pepper, beet, radish, parsley and lettuce. The attacks occur on the roots, crown and lower portion of the stem and have been found to be more severe during the spring, autumn and winter seasons.

Where the nests are accessible, fumigation with carbon bisulphide has proved the more efficient method of control. If the nest occurs on the surface of the ground, place a saucer containing a few ounces of the liquid fumigant on the ground over the nest and cover the whole with several thicknesses of heavy canvas. Allow the fumigation to continue for at least 24 hours. If the nest is underground, push swabs of absorbent cotton saturated in the fumigant down into the nest, firmly packing the soil over them.

In case these methods cannot be applied, poison baits may be used. (Paris green and bran, or potassium arsenate mixed with orange pulp, &c.

(1) See also *B.* Jan. 1916 No. 134.

ing the ants with hot water is also an advantageous method and fish scrap fertiliser may be found to have some value as a repellent.

182 - **Staphylinid Injurious to Turnips in France.** VINCENT in *Comptes rendus des Seances de l'Academie d'Agriculture de France*, Vol. II, No. 1, pp. 25-28. Paris, January 26, 1916.

In the localities of the Department of Finistère where turnips are chiefly cultivated, circular zones may often be observed where the crop is thin and irregular. Some of the plants wither and quickly die off, others are dwarfed and weedy. The leaves and tap root do not show any traces of fungoid disease, but on examining the surrounding soil numerous larvae will be seen which attack and devour the roots.

The larvae are from 3 to 4 mm. long; body creamy white, head black. The black adults bred from the larvae in the laboratory were identified as belonging to the family of the Staphylinidae. This insect is very sensitive to insecticides. Good results were obtained with toluene and still better ones with benzine in the proportion of 8.8 gallons per acre.

However, it would probably be more economical to give up the crop or at any rate to adopt a rotation.

183 - ***Tinea cloacella*, Injurious to Dried Edible Mushrooms.** KRAUSSE in *Zeitschrift für Forst- und Jagdwesen*, Year 48, No. 2, pp. 73-78, Berlin, February 1916.

On March 22, 1915, the writer received from Eberswalde (Germany) a quantity of dried mushrooms which had been attacked by larvae of different ages.

The first adult insect emerged on April 9, and was identified as *Tinea cloacella*. Most of the adults, however, did not appear till May.

The first mating was observed on May 16. During the mating period, the phototropism of the insects was more strongly positive than usual.

The eggs were always deposed singly on the mushrooms. The writer confined a number of males and females in a cage, together with small bits of mushroom; eight days after, in addition to the eggs, there were a number of young larvae about 1 mm. in length.

It is interesting to note that the insect requires very little water for its development and that many larvae die before pupating, in the same way many others do not survive the pupal stage.

The completely developed larvae are 9 mm. long, the pupae about 5 mm. The bodies of the former are covered with excrescences which resemble closely the hairs characteristic of Lepidopterous larvae. This is a point which should prove interesting from the systematic point of view.

As dried mushrooms become worthless when attacked by *Tinea cloacella*, it is advisable to examine them from time to time, removing all those attacked by the Lepidopteron.

184 - **The "Fruit-fly" (*Ceratitis capitata*) Injurious to Citrus in Greece** (1) PAPAGEORGIOS P. in *Deltion Vasilikis Georgikis Etaireias*, Year VII, No. 12, pp. 258-260, Fig. 1. Athens, 1916.

Ceratitis capitata caused considerable damage in 1915 among Citrus trees in Attica and Epirus. The fruit of lemons, oranges and mandarins

(1) See *B.* Sept. 1915 No. 913. (*Ed.*).

attacked by this insect are unsaleable and often drop to the ground ... slightest breath of wind.

The following means of control are advised:

1) All tainted fruit to be collected and treated with lime, as ... the larvae and prevents the development of subsequent generation.

2) Tin cans containing sweetened poisonous substances to be ... the plantations to every 20 th. tree; good results were obtained by ... cent solution of arsenate of soda added to grape syrup; the Dipter... round the cans and, absorbing the liquid, are killed in great numb...

485 **The Bagworm (*Thyridopteryx ephemeræformis*), an Injurious Shade-Tree Insect.** HOWARD L. O. and CHITTENDEN F. H. in *United States Department of Agriculture, Farmer's Bulletin*, No. 701, pp. 1-11, Figs. 1-13; Washington, Jan. 15, 1916.

Thyridopteryx ephemeræformis ("Bagworm" or "Basketworm") ... recently caused considerable damage in the States of New Jersey, P... sylvania, Maryland, Virginia, West Virginia, Ohio, Indiana and Illi...

The larvae of this lepidopteron construct themselves a sort of ... with the aid of fragments of leaves cut from trees and held together ... means of silk. The anterior portion of the body of the larva remains ... and the animal crawls about on the branches and devours the leaves ... large number of plants. Practically all shade trees are attacked ... some years the larvae are found on nearly every species of orchard ... forest tree also. They also occur on willows, maples, poplars and mallow... and less frequently on elms and oaks. They even feed to a certain ex... on many low-growing semiwoody plants, such as elder, mallow and ragwe...

Among the natural enemies of this insect are: *(Pimpla) Hoplocampoidator* Say; *(Pimpla) P. conquisitor* Say; *(Hemiteles) Allocota thyridopterigis* Riley; *Spilochalcis moriae* Riley; *Chalcis ovata* Say; *Dibrachys cheanus* Ratz and *Habrocytus thyridopterigis* Ashm.

The following methods of treatment are advised:

1) Where possible, collect the larvae and destroy them directly.

2) Encourage the development and reproduction of the nat... enemies.

3) Spray with arsenicals.

INJURIOUS VERTEBRATES.

486 **Comparative Experiments in Austria on the Control of Field-Voles (...).** MAX FRANZ in *Wiener Landwirtschaftliche Zeitung*, Year 66, No. 8, pp. 20-27; Vienna, February 15, 1916.

An account of experiments carried out at the initiative of the Zo... section of the "Landes-Kulturrat" of Bohemia, from March to May 1... on the control of field voles making use of various methods. The ... spring weather which was favourable to the reproduction of these rodent...

(1) See *B.* Jan. 1915, No. 132; and *B.* Feb. 1, 1916, No. 204.

was also suitable for conducting the experiments. The plots of ground chosen for the purpose of the experiment were sown with clover except in a few cases where rye was used. Ditches, banks, etc. were also included.

The average number of holes counted in the fields was 5 per square meter and varied from 1 to 10. The fields were invaded to such an extent that all the plants around the holes had been destroyed for a distance of 15 cm. Three or four days before the experiment, the holes were all closed by stamping in the earth. Only those holes which the voles re-opened were used for the experiment.

The results were as follows:

1) PILLS CONTAINING 20 % OF BARIUM CARBONATE. — Five pills each weighing 0.5 gms. were placed in a hole, or between two tiles placed in the open field. During March, 40 holes and 8 pairs of tiles were treated. The pills placed in the holes gave positive results in 70 % of the cases. The pills placed in the open, between the tiles, gave negative results.

2) PHOSPHORUS PILLS. — Four pills weighing 1-1.5 gms. each were placed in each hole. The experiments were carried out during March on 40 holes with two types of pills. The first type gave positive results in 25 per cent of the cases, and the second type positive results in 28 per cent. The same experiments repeated in May gave negative results throughout.

3) PHOSPHORUS PASTE. — Straw was smeared with the paste and placed in the holes. When the voles left their holes some of the paste adhered to their bodies, the rodents then licked themselves and were poisoned. Thirty holes were treated in this way and left open during the whole period of experiment. The voles were usually poisoned after 3 days. The experiments conducted both in March and May gave positive results in 72 cases per cent.

4) ARSENICAL PASTE. — This mixture was composed of arsenious acid, caustic soda, potato meal, water and molasses.

It was employed in the same manner as in the preceding experiments. Thirty holes were treated and both in March and May, 50 cases per cent gave positive results.

5) GRAINS OF WHEAT POISONED WITH STRYCHNINE. — The grains were soaked for 45 hours in a strychnine solution containing 4 gms. of poison (nitrate) per kg. of wheat.

The grain was then sweetened with saccharose or saccharine; 1 gm. of calcium bicarbonate was then added to the mixture with some fuchsin to restore the grains to their normal colour. The grains were then put into the holes.

Forty holes were thus treated. The experiments made in March gave positive results in 87 cases per cent; those carried out in May gave similar results only in 7 cases per cent.

6) OAT GRAINS POISONED WITH STRYCHNINE. — The husks were first removed from the grains and these latter then treated like the wheat. The experiment was made on 40 holes. In March, good results were obtained in 92 cases per cent; in May, only in 7 cases per cent.

7) MORPHINE PILLS. — Five pills were placed in each hole which

was then closed. Part of the pills were put out when the weather was dry and part when it was wet. In the first case good results were obtained; in the second they were negative.

8) POISONED BISCUITS. — The poisoned biscuits placed in the vole holes were not eaten.

9) CARBON DISULPHIDE. — This was injected into the holes by means of a special apparatus. The result was satisfactory whenever the hole was well filled by the gas. Carbon disulphide is, however, difficult to employ.

10) SULPHUR DIOXIDE. — This was introduced into the holes by means of special cartridges invented by the writer.

Finally, experiments were made with traps.

Conclusions. — 1) The results obtained by the different methods depend upon a number of factors, such as: the season in which the campaign is conducted, the nature of the soil; the number of voles in the area, etc.;

2) During the winter and in early spring, when food is scarce, the best method is that with poisoned grain and particularly the oat-grain treated with strychnine;

3) Pastes also gave good results, especially the arsenical paste, which has the advantage of being adapted for use in all seasons;

4) Of the pills, those containing morphine gave the best results.

5) In April and October when the soil is well stocked with food, the employment of gases is advisable.

6) For destroying voles in ditches or banks, etc. the best medium is sulphur dioxide.

487 – **Plague of Field-Voles in the Province of Kieff during 1914.** — CHARLEMAGNE in *Khoziaistwo* (The Farm), No. 45-46, pp. 1058-1059. Kiew, 1915.

In 1914, many provinces of South Russia were very seriously invaded by field voles, while in the spring of the following year the number of the rodents was greatly diminished; in fact, in some places they had entirely disappeared. In the autumn, when it was possible to form a judgment, from the number of holes, of the extent of the attack, it was seen that this number was not above the normal. The cause of the rapid disappearance of the animals is attributed to weather conditions. The spring of 1915 was a very changeable one. Up till February, the weather was very mild and the snow melted almost everywhere; in the latter half of the month, however, the cold returned, snow fell once more and the water froze in the fields. This sudden return of winter must have had bad effects on the voles.

After the spring in question, *Microtus arvalis* Pall. disappeared almost completely from the province of Kieff; *Evotomys glareolus* Scheb. was seen very rarely, and the number of *Arvicola amphibius* L. markedly diminished. The number of other species of rodents also decreased.

In connection with this decrease, the opinion is quoted of K. A. SATCHINE who, when speaking of the distributional centres of voles, says that the problem of the control of voles is confined to the discovery and destruction of such centres during the years in which their numbers are observed to be less.

According to some writers, the vole plagues occur approximately every ten years. If this is admitted, the above advice may well be borne in mind.

ALFREDO RUGGERI, *gerente responsabile*